

Clemson University



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CLEMSON UNIVERSITY



ANNUAL REPORT 1991-1992

Printed Under The Direction Of The
State Budget And Control Board

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1991/92

CLEMSON UNIVERSITY

PRESIDENT

Our institutional vision for the future embraces a commitment to become the nation's leading, technologically oriented, land-grant university.

The opportunity to be such an institution is the driving force behind our strategic planning and continuous improvement efforts. We welcome this challenge.

The President's Advisory Council has suggested that the University must think globally if it is to realize this vision. We have taken that advice, and we are taking it a step further. We are planning globally, and we are acting globally. We are working to find within the challenges of the globe, opportunities to advance the economic, social and technological well-being of the people of South Carolina.

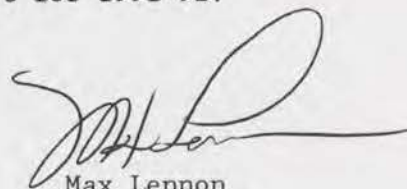
When we visited with the Prime Minister of Japan at year's end 1991, we were impressed with his significant interest in Clemson and with the opportunities for partnerships that abound in that part of the world.

When we awarded 39 degrees to the first graduates of Clemson's Master of Business Administration program in Italy in August of 1992, we were struck by the opportunities that exist to make a difference in the business of the world.

And when German automaker BMW announced in June plans for a \$300-million assembly plant in our state, it brought home just how much opportunity there is for South Carolina to prosper in the international marketplace.

Clemson University is an institution that finds opportunity in challenge. It is an institution where opportunity becomes reality.

As evidence, we present our annual report for 1991-92.



Max Lennon

President

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1991-92 ADMINISTRATIVE OFFICERS

Executive

Max Lennon, Ph.D.	President
J. Charles Jennett, Ph.D.	Provost and Vice President for Academic Affairs
Hugh J. Clausen, J.D.	Vice President for Administration and Secretary of the Board of Trustees
Milton B. Wise, Ph.D.	Vice President and Vice Provost for Agriculture and Natural Resources
David R. Larson, M.B.A.	Vice President for Business and Finance
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G. Jay Gogue, Ph.D.	Vice President for Research
Manning N. Lomax, B.S.	Vice President for Student Affairs

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G. Jay Gogue, Ph.D.	Acting Dean of the Graduate School
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James R. Fischer, Ph.D.	Dean, Agricultural Research and Director, S.C. Agricultural Experiment Station
Byron K. Webb, Ph.D.	Dean and Director, Cooperative Extension Service
James F. Barker, M.A.	Dean, College of Architecture
Ryan C. Amacher, Ph.D.	Dean, College of Commerce and Industry
Gordon W. Gray, Ed.D.	Dean, College of Education
William B. Barlage, Ph.D.	Acting Dean, College of Engineering
Benton H. Box, D.F.	Dean, College of Forest and Recreation Resources
Robert A. Waller, Ph.D.	Dean, College of Liberal Arts
Opal Hipps, Ph.D.	Dean, College of Nursing
Bobby G. Wixson, Ph.D.	Dean, College of Sciences
Bobby J. Skelton, Ph.D.	Vice Provost and Dean of Admissions and Registration

1991-92 BOARD OF TRUSTEES

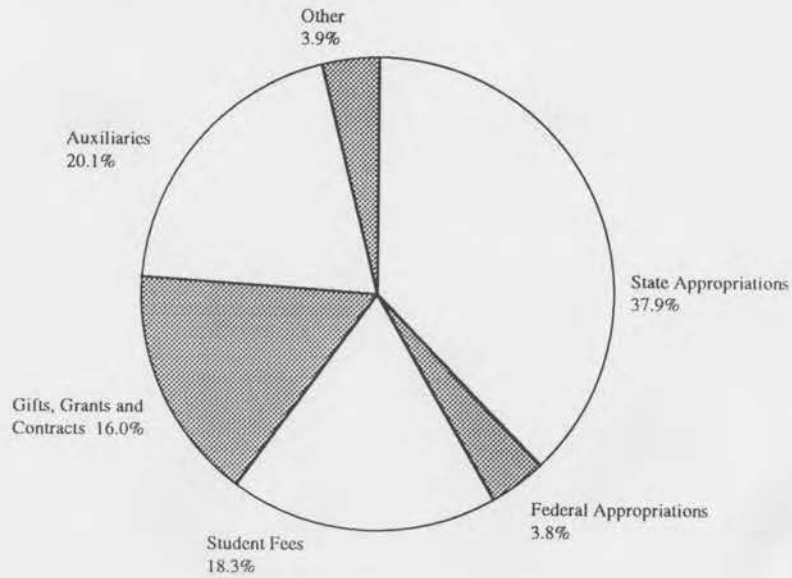
Bill L. Amick, Chairman	Batesburg
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Philip H. Prince	Pawleys Island
Joseph D. Swann	Greenville
Allen P. Wood	Florence

Trustees Emeriti

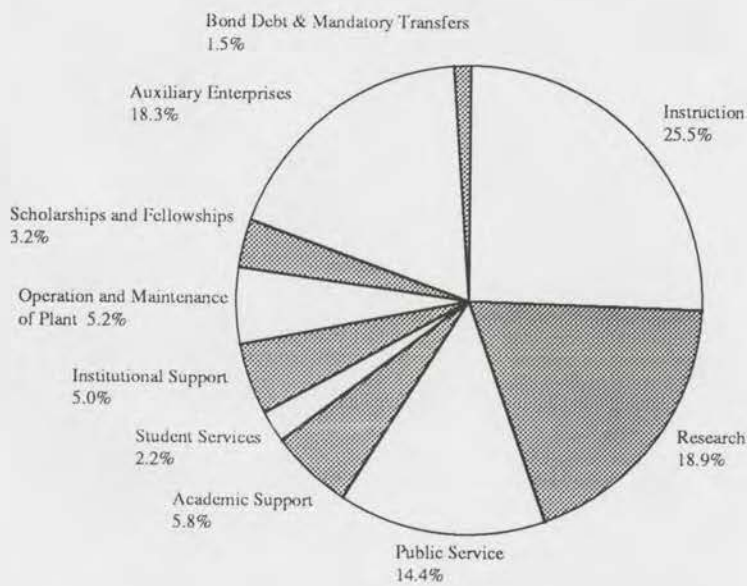
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William N. Geiger Jr.	Columbia
Paul W. McAlister	Laurens
Paul Quattlebaum Jr.	Charleston
James C. Self	Greenwood
D. Leslie Tindal	Pinewood
James M. Waddell Jr.	Beaufort

CURRENT FUND REVENUES AND EXPENDITURES FOR THE YEAR ENDED JUNE 30, 1992

Current Fund Revenues



Current Fund Expenditures



COLLEGE OF AGRICULTURAL SCIENCES

The report of 1991-1992 activities for the College of Agricultural Sciences' academic, research and Extension programs is included under the Division of Agricultural and Natural Resources on Page 58.

COLLEGE OF ARCHITECTURE

The College of Architecture completed its most successful year ever in 1991-92. This success can be measured in several ways:

- the quality of the work of the students demonstrated in the awards won in national design competitions;
- the quality of the teaching of the faculty demonstrated in the naming of Professor David Egan as a National Distinguished Professor by the Association of Collegiate Schools of Architecture (giving the college five such distinguished professors — the most of any school of architecture in North America); and the recognition of the Ph.D. dissertation of Assistant Professor Kerry Brooks as winner of the University of Washington Faculty Medal and the winner of the American Planning Association and the Planning Association of Washington's Honor Award for his doctoral research;
- the college's first endowed professorship, the Robert Mills Professorship, which was put in place for the 1992-93 academic year;
- the college's first endowed chair, the Homer Curtis Mickel and Leola Carter Mickel Endowed Chair in Architecture, was established by Mrs. Charles Daniel in the name of her parents;
- the reaccreditation of the professional programs in architecture by the National Architectural Accrediting Board. This marked the seventh full five-year accreditation for Architectural Studies;
- the successful review by the Commission on Higher Education of all college programs and the consultant recommendation that the graduate program in architecture receive commendation as a program of national prominence;
- the ground breaking for the addition/renovation project to add new space for two art studios, one design studio, faculty and staff offices, and one classroom to the college facilities;
- the development of a student credo which attempts to identify the sense of community felt by the students in the college. It reads:

"As students in the College of Architecture we believe in the value of materials and the honesty of the human spirit; we offer you the timeless challenge of uniting these beliefs to improve our work through concern and innovative thought."

These indicators of progress identify some of the unique qualities of the College of Architecture and give confidence to our efforts to reach the promise of a College of Architecture in the state of South Carolina which is seen as America's finest.

Strategic planning and communication have been keys to this progress. The college began a long-term effort to undergird the strategic planning process with a quality initiative. This work began in 1991-92 but is seen as a multi-year commitment to shape a quality initiative (continuous improvement) to fit the unique qualities of the College of Architecture.

Special Programs

The Clemson Architectural Foundation Lecture Series, supported by donations to the Clemson Architectural Foundation, sponsored the following speakers for the academic year 1991-92:

September 9	Carlos Jimenez.....	"Origins and Recent Work"; Vulcan Materials Lectureship
September 23	Jeffrey Kipnis.....	"Weak Form Political Space"; Richtex Lectureship
October 14	George O. Jackson, Jr.	"The Ephemeral Art of the Mexican Festival"; Holnan Inc.— Santee Cement Lec- tureship
November 4.....	Peter Waldman.....	"Specifications for Construc- tion: A Garden for the Sphinx, a Stable for the Tro- jan Horse, and a Campground for the Three Little Pigs"
March 2.....	Chris Rose	"Affordable Housing: AIA Award"; CAF Lectureship
April 3	E. Fay Jones	"Organic Architecture and the Role of Historical Mo- dels"; S.C. Forestry Associa- tion Lectureship
April 6	Mark Mack	"California Houses: Nation- al and International Strate- gies"; Boudreaux, Hulstrand and Carter, Ltd. Lectureship

The Rudolph E. Lee Gallery is the University's art gallery, and the following exhibitions were shown last year:

Aug 30 - Sept 22	Voodoo Flags From Haiti
Oct 4 - 25.....	Solo Exhibition, Tom Dimond
Nov 4 - 24	Southern Environmental
Dec 2 - 13	MFA Thesis Work
Jan 13 - Feb 2	Printmaker's Portfolio Exchange
Feb 10 - March 1.....	Maude Callen: Nurse Midwife
March 6 - 27	Solo Exhibition Katherine Kadish
March 30 - April 10.....	MFA Thesis Show

Art Department

The department conducted a national search for an artist/educator in the field of sculpture. The response to this search was extremely positive and also overwhelming, as 205 applications were received and reviewed by the search committee. The applicants were narrowed to a field of seven with all seven receiving invitations to visit Clemson for interviews and presentations. David Detrich, a sculptor with degrees from the Kansas City Art Institute and Alfred University, accepted the position. David has 10 years of experience in artist residency programs, regional and national exhibitions and higher education teaching.

Professor Robert Hunter retired this spring after a 35 year career in the College of Architecture as an artist educator. Bob was one of the original faculty assembled by Harlan E. McClure in the 1950s that brought national recognition to the college, establishing the foundation on which the college continues to prosper. Bob will continue his creative career in the areas of drawing, painting, printmaking and sculpture.

The department requested and received a name change from the University and now is officially the Art Department. The name evolved from its origin, history and visual studies, to visual arts and history, and now to Art Department.

Professor Cecilia Voelker spent the 1992 spring semester conducting research that contributed to a major exhibition in Genoa, Italy, that celebrates the Columbus quincentary. She was invited to be the coordinator of Colonial Ecclesiastical Architecture in the Western Hemisphere at the request of the Italian Government through the Institute of Lombard Studies in Milan. This research placed her in contact with faculty and universities in Quebec, Mexico City, Brazil, Peru and the United States.

Highlights of professional activity of the studio art faculty:

- Jim Buonaccorsi — National Sculpture Exhibition, Deland Museum, FL; Exploit/Expose — Why War?, B4 Art Gallery, New York City.
- Syd Cross — S.C. Arts Commission Triennial Exhibition, S.C. State Museum, Columbia; North Dakota Print and Drawing Annual Exhibition, University of North Dakota, Grand Forks.
- Tom Dimond — One Man Show from Sabbatical Leave Year, Rudolph E. Lee Gallery, Clemson; Permanent Collection, Greenville County Art Museum.
- Sam Wang — One Person Exhibition of Photographs, Georgia Southern University.
- Mike Vatalaro — S.C. Arts Commission Triennial Exhibition, S.C. State Museum, Columbia; Clemson Clay Exhibition, Gallerie Atelier, Philadelphia.

The 1991-92 Visiting Artist Program included:

- Geno Rodriguez — Founder and director of the Alternative Museum, New York City.
- Katherine Kadish — Nationally recognized painter who exhibited in our Lee Hall Gallery, March 1992.
- Richard Powell — Scholar, researcher, writer, professor of art history at Duke University; curator of Homecoming, the major exhibition of William H. Johnson at the National Museum of American Art, Washington, 1992.
- Richard Lou, Clemson MFA graduate who has distinguished himself as a national/international artist with the Border Arts Workshop, San Diego, represented the United States in the 1990 Venice Biennial.

Department of Architectural Studies

This has been a good year for the department. We received our sixth consecutive five-year accreditation period from the NAAB. The CHE designated our Master of Architecture offering as a "program of national significance." Faculty and students have distinguished themselves in a variety of significant ways.

Pre-Enrollment

Yuji Kishimoto

Lolly Tai

Six faculty volunteers

Professor Kishimoto's two-week Architecture Camp for high school students completed its fourth year of operation. This excellent program for young people who are in their sophomore or junior year of high school, expanded to two sessions and accommodated nearly 30 participants.

Six of our faculty members gave one morning a week to individual meetings with prospective students and their families to provide an introduction to our programs, facilities and students.

In addition, we participated in a variety of career day sessions at various high schools throughout the state. We feel this type of public awareness activity is especially important for our professional program.

Foundation

Bob Hunter
Clarence Addison
Birsen Doruk
Jane Hurt

Two of our faculty members participated in the interdisciplinary foundation program. This series of four courses at the freshmen level introduced students in design, landscape, art and construction to the principles and elements of design. In addition, we introduced them to the purpose of a university education as a means of establishing an open minded approach to learning.

Professor Robert Hunter (Art Department) produced a two volume retrospective of the foundation program. This provided an in-depth look at our approach to the teaching and learning of introductory level design. It also provided an in-depth look at how 18-year-olds think and behave.

To better assimilate those students who wish to change their major to design, we established a summer program that is a precise mirror of the normal first year, but also allowed for some experimentation with course work.

Undergraduate Programs

(J. Hurt, B. Doruk)
2 - Harry Harritos
Rob Silance
Danita Brown
Marvolyn Alexander
3 - Bob Hogan, director
Gordon Patterson
Bill Tabberson
Durham Crout
4 - Pam Harwood
Lynn Craig
Bob Eflin
Teoman Doruk
(Ray Huff, Lolly Tai)

We view the teaching of our undergraduate program as a 1 + 3 system. The first part is our foundation program and the second part consists of studios 2, 3 and 4 which we now are considering as a cohesive sequence of exercises, projects and events. The faculty in the undergraduate program adopted a new syllabus that sets the framework for each year around ideas related to:

- the elements of architecture,
- house,
- settlement, and
- institution.

A separate credit is set aside each semester for lectures and discussions which address issues related to:

- theories of architecture,
- the integration of technology into design, and
- the ways in which we practice.

We continued our vertical studio efforts during the spring semester, this year adopting the theme "Orientation in the Urban Environment."

Bill Tabberson, visiting assistant professor, received the first AIAS Award for teaching.

Durham Crout returned to University of Pennsylvania to complete course work in preparation for his Ph.D.

At the fourth year level, the faculty initiated the New Directions Studio. This afforded an opportunity for those seniors who will find their careers in fields other than architecture to study various alternatives and prepare in-depth reports and projects in new directions.

The senior exit project fashioned last year had its focus on ideas related to the "institution" in society.

The field trips to major urban centers were very successful. Second year (Charleston), third year (New York) and fourth year (Chicago) trips introduced students to the architecture of the city, and they had the chance to visit with architects in their offices.

As president of AIAS, Robin Roberts continued to increase the membership of the organization, which provided programs and activities throughout the school year. The most notable of these programs was our second annual Graphics Workshop which brought Kirby Lockhart, a nationally recognized architectural delinquent, to campus for a full day workshop. Professor Harritos helped to organize this as well as served as AIAS faculty adviser.

Charleston

Ray Huff, director

The Charleston Studio continues to provide a forum for our discussion of expectations and consistently higher standards. The intensity and discipline of the small studio in the magnificent urban setting cannot be matched in the bigger arena of the University.

The Charleston program continued to provide an opportunity for a bimonthly casual gathering of architects and students at the Tuesday night lecture/film series.

Post Baccalaureate

Dale Hutton

We received more than double our usual number of applications for this program, and we were able to bring in nine students with extraordinary qualifications.

Students in the Post Baccalaureate program spend one to two years making up deficiencies before applying for a position in the two year Master of Architecture program.

Professor Dale Hutton worked to improve the status of Post Baccalaureate students by arranging to have their courses taught at graduate level. Dr. Harold Coolidge, emeritus professor of architectural history offered a special history sequence for these students.

Genoa

Cesare Fera, director

Tom Sammons

John Jacques

We established a clear focus for the Genoa program that included a series of issues surrounding urbanism, the public square and the architecture of the city. Studies in architectural history, current issues in European architecture and elaborate field studies were complementary to the studio project work.

Visiting European architects complemented the interests of Professor Sammons and Dr. Fera by presenting to the students not only what they do, but also how they

go about doing it within the European methods of design and construction. This past year's visitors included Mark Carroll (from the office of Renzo Piano), Severio Fera (from Studio Fera), and the Milanese architect and critic Alessandro Rocca.

Master of Architecture and Health

David Allison, director

Professor Allison's approach was to combine the traditional strengths of this program with one that establishes stronger links with other faculty and departments within the college. We established strong ties with the planning program in addition to the other graduate faculty and health care professionals from around the region.

As a member of the AIA/AHA committee on health, Professor Allison helped two of his students receive significant grants for their thesis work. Willy Schlein and Jim Jepson presented their work to the committee at the 1992 National AIA meeting in Boston.

Master of Architecture

(Peter Lee, director)

Yuji Kishimoto

Richard Norman

Joe Burton

Rob Miller

Matthew Rice

The overall quality of thesis work in the Master of Architecture program continued to improve. In the selection, exploration, and resolution of individually sponsored theses, the students produced a most remarkably varied set of ideas. Most of the committees were interdisciplinary in nature, often including a variety of members from all parts of the campus as well as professionals from the region.

The NAAB visiting team identified a number of issues for us to address during the next five year period:

- Provide a better integration of technology in design studios;
- Work to appoint a woman faculty member within the graduate studios, and
- Provide a clear, programmatic relationship between undergraduate and graduate study.

We already are working on these issues as we chart a fresh course for 1996.

One of our students, Steven Mackey, placed second in an international design competition for a camp in Antarctica. His work, completed within Professor Norman's studio, was executed on the computer.

Two faculty members, Dr. Joe Burton and Professor Rob Miller, had papers accepted within nationally recognized publications.

Professor Peter Lee was away on a Fulbright Fellowship as a senior lecturer teaching in Amman, Jordan.

Master of Science

Martin Davis

This new program, which just completed its second year of operation, now has four students working in three areas of research. These areas include energy, health care and computers.

Professor Davis provided coordination for these programs, initiating new courses in research methods in addition to writing research proposals and grant applications. A major grant to establish a five year research program received approval at the state level. His work for the "Excellence House," a model of energy efficiency, resulted in the construction of three dwellings and plans for a fourth.

It is our feeling that the Master of Science program will offer opportunities for real inroads into research and into the science of our profession.

Remarks

A variety of our faculty members were active in professional organizations and organizations related to their specific areas of interest. We are very proud of these alliances that keep us in constant touch with other members of our field. Of particular note is Dean Barker's role as president of the ACSA (Association of Collegiate Schools of Architecture).

As Director of Membership Services for SCAIA, John Jacques will be providing an initiative to align the AIA and CAF in a coordinated continuing education effort.

By all accounts the restructuring efforts fashioned within last year's operation proved to be extremely valuable changes to the ongoing quality of all of the department's programs, activities and events.

Department of Construction Science and Management

The students, faculty and staff of the Department of Construction Science and Management were involved in many activities and achievements during the 1991-92 academic year as noted in this report.

Research and Educational Development Activities

The following projects were completed:

- Development of a participant manual and instructor guide for a construction education program entitled, "Total Quality Management for the Construction Industry." The work was funded by the Associated Builders and Contractors, Inc.(ABC), Washington and is available to the construction industry. In conjunction with the program, the department is involved in developing and conducting a series of one day workshops on the topic of TQM;
- The first in a series of six educational programs for the National Association of Women in Construction (NAWIC) Certified Construction Associate (CCA) was developed.

The following projects were ongoing:

- The proposal for the College of Architecture Research and Educational Center continues to be reviewed. Final action is anticipated during the next academic year;
- Work continues on the \$80,000 National Association of Women in Construction Certified Construction Associate program. A Canadian supplement to go with the first program and a national examination will be developed during the 1992-93 academic year. Work also is anticipated to begin on other books in the program;
- The department continued to score and maintain the national testing process for the National Association of Women in Construction Certified Construction Associate Program;
- Research continued on the Construction Industry Institute \$110,000 funded research project on construction safety. The project is anticipated to be completed by the end of the 1992-93 academic year.

The funds received from the research and educational development efforts helped to support more than \$15,000 in graduate assistantships and served as seed money for other similar efforts for the faculty.

The following new projects were initiated:

- A funded (\$5,000) research project by the Construction Industry Workforce Foundation (CIWF) to determine why construction contractors don't train their workforce and based on existing studies, why most of the reasons are myths;
- An unfunded project for the national office of Associated Builders and Contractors (ABC) to study why their members don't support the Clemson/ABC Academies to a greater degree than they do;
- A Clemson University funded (\$10,000) research project to ascertain whether or not students who are taking the structures courses in the CSM program will perform better if they are taught using structural modeling versus if they weren't;
- A funded (\$2,000) project sponsored by the Brick Association of S.C. to determine cost factors in constructing with brick;
- A funded (\$3,000) McClure Endowment Teaching Grant to develop a course dealing with the relationship between technical and design disciplines.

Service Activities

- The department continued work with the national office of ABC, conducting five supervisor, five project manager, and one safety academy during the 1991-92 academic year. This year saw the first supervisor academy being conducted at a location (Baton Rouge) other than Clemson. This effort will be expanded in future years to include other locations and academic.

The planning for the Executive Management Academy continued with the first one planned for early December 1992 at Clemson. To date more than 1,000 individuals, representing more than 350 companies from throughout the U.S. have participated in one or more of the academies.

- The first Construction Supervisor Institute for the Carolinas Chapter of the Associated General Contractors of America (AGC) was successfully conducted in February 1992. A second one is planned for October 1992. In addition the department is working with the chapter to develop and conduct a one week summer camp for high school students who may be interested in the construction industry as a career.

Funds from this effort supported more than \$30,000 in faculty and staff development, student activities and equipment purchases. Finally, the faculty were active in developing and/or conducting continuing education courses for the construction industry as noted later in this report.

Development Activities

The second annual Constructor's Guild Golf Tournament was held in October 1992 and involved all of the department's faculty, staff, many of its students, and local constructors. Approximately \$2,000 was raised to support student field trips and travel to annual conventions of major construction trade associations during the year.

The annual fund raising campaign brought more than \$6,000 to the department's PDP and Endowment accounts during the year. Monies from the PDP account were used to purchase needed computer equipment for the faculty and staff.

Administration/Faculty/Staff Activities

Some of the major activities and accomplishments of the department faculty during the 1991-92 academic year are noted below.

Clarence Addison continued to serve as the faculty adviser for Sigma Lambda Chi, the honorary construction society. This organization had its largest membership during the year. In addition he also was active in the local community working with Habitat for Humanity and served on various University faculty committees.

Kirk Bingenheimer joined the faculty in a temporary position for the 1991-92 academic year. He was very active in directing some of the department's research and helped plan for and facilitate the ABC Academies and AGC Supervisor Institute. He was instrumental in obtaining \$71,500 in computer software for the department. Finally, he served as secretary for the Piedmont Chapter of the American Institute of Constructors.

Norman Book returned from his sabbatical and resumed his teaching and advising activities. He was involved in developing various structural system instructional units for his courses and was instrumental in obtaining \$5,000 in computer software for the department.

Gregg Corley continued to serve as the faculty adviser to the student chapter of Associated Builders and Contractors. He also served as the department's representative on the college curriculum committee, chair of the department's curriculum committee, and chair of the Microcomputer Committee for Associated Schools of Construction. He continued as a Research Associate on the NAWIC Curriculum Development Project, taught in the ABC/Clemson Academies, co-developed and taught a series of construction safety workshops for the Carolinas Chapter of AGC and other organizations, and developed and taught two workshops held at the national conventions of ABC and NAWIC. Finally, he obtained \$5,500 in computer software for the department.

David Egan received an ACSA Distinguished Professor award at the annual meeting of the Association of Collegiate Schools of Architecture. He continued to be very active in many professional associations relating to acoustics and lighting, including presentations of papers and workshops at their regional and annual meetings. In addition he continued to coordinate the Robert Newman Award program.

Francis Eubanks received the Klinger Award as outstanding construction educator from the American Institute of Constructors. He also served as treasurer for the Piedmont chapter of the institute and faculty adviser to the AIC Student Chapter. He co-developed and taught a series of construction safety workshops for the Carolinas Chapter of AGC and other organizations and two graduate courses by way of the telecampus state educational television network. Finally, he had three papers published in juried professional Journals and made a presentation at the regional conference of the Associated Schools of Construction.

John Mumford continued his work as research associate for the National Association of Women in Construction Curriculum Project. He served as faculty adviser to the student chapter of the National Association of Home Builders. In addition he was successful in receiving two funded grants: \$3,000 McClure Endowment Teaching Grant to develop a course dealing with the relationship between technical and design disciplines and a \$10,000 Clemson University Award Grant to determine if student academic performance is improved utilizing structural modeling in the classroom. Finally, he coordinated the annual Wood Seminar, sponsored by the Southern Wood Products Association.

Steve Schuette resigned from the program to take a department chair position at Purdue University's construction education program. During the year he was chair of the college's Space Utilization and Curriculum Committees and the faculty adviser for the student chapter of the Associated General Contractors of America. He also served as regional director to the National Board of the Associated Schools of Construction and was elected to the vice president position of the same organization. He taught the Clemson/ABC academies and Carolinas AGC Supervisor Institute.

The staff (Reta Hancock and Angie King) attended workshops during the year to improve their skills and knowledge related to their job duties. The department head, Roger Liska, was elected to the Merit Shop Foundation Board of Trustees for a three-year term. He also served on the Management Education Committee for the Associated Builders and Contractors. As immediate past president, he served on the national executive committee for the American Council for Construction Education and is a trustee on their board. He also was chair of the Nominating Committee and Strategic Planning Committee for the council. In addition, he was elected national vice president of the American Institute of Constructors, serves on the board of directors, is chair of the Publications Committee, and serves as editor of the AIC Journal. He worked as an adviser to AGC's national Contractor Competencies Taskforce and served as a member on the Certification Committee for the Construction Management Association of America. During the year he made more than 40 presentations on construction-related topics including total quality management and construction training to local, regional and national meetings of many construction associations, including Associated Builders and Contractors, National Association of Women in Construction, and the Merit Shop Contractors Association of Canada. He also traveled extensively, including participating on accreditation teams in the United Kingdom and Hong Kong. Finally, as a member of the College of Architecture Quality Initiative Group, he has developed and conducted training sessions for the college.

Department of Planning Studies

The Department of Planning Studies completed its 24th academic session this summer with another successful year. In the various areas of endeavor, the achievements and performance of faculty and students reflected increasing levels of activity and quality.

New

This year the department was on solid ground with a stable faculty, high quality students, and a recently revised curriculum which quickly proved to be well-balanced in the content areas that support a well-rounded planning education with a professional application thrust. An assessment of the curriculum effectiveness resulted in switching the Physical Planning Studio from the second to the first semester for incoming students, while Theory was moved to the second semester.

The CHE Review of the program recommended continuation. No major deficiency was discovered.

Faculty

Robert Bainbridge was a visiting assistant professor in the department and taught:

- Physical Planning Studio
- Historic Preservation Planning
- Introduction to CRP
- Comprehensive Planning Studio
- Chaired or participated in several graduate advisory committees

In joint effort with others, he prepared guidelines for a concentration in Historic Preservation Planning that will be open to planning and architecture graduate students.

The Palmetto Trust for Historic Preservation elected Bob as its chairman this year.

In the summer Bob traveled to England and Wales where he conducted extensive meetings with officials of the National Trust as well as other agencies responsible for planning and historic preservation in London and the rest of the U.K.

Kerry Brooks had a fruitful year receiving his Ph.D. from The University of Washington. His dissertation earned him The Faculty Medal Award as well as the American Planning Association and the Planning Association of Washington's Honor Award for his doctoral research. He continued a successful track record of teaching with particular attention to area of expertise in Geographic Information Systems. Courses taught last year included:

- Comprehensive Planning Studio
- Planning Methods
- Introduction to GS
- Advanced Topics in GS

During the summer Kerry reorganized existing equipment and created a computer lab dedicated to GS. Other activities included the following:

- Board Member, Central Citizens for Change
- SCAPA Professional Development Committee
- Clemson University ArcInfo Coordinator
- State Mapping Advisory Committee, Chair GIS Sub-Committee
- Suitability study for John's Island, SC
- USDA-NRI Research (with Barkley and Henry)
- Midlands COG/DHEC
- Tri-County Summer

Jose R. Caban continued as head of the department and professor, teaching the following courses last year:

- Urban Design
- Problems in Site Planning
- Directed Studies

He also participated in several thesis committees and chaired five. He continued efforts in recruitment, public service coordination, TQM initiative, and college-wide service.

Other activities included:

- Member of the S.C. Chapter of the American Planning Association's executive committee.
- National Chairman of the American Planning Association Urban Design Division.
- Editor of *Urban Design and Preservation Quarterly*.
- Organized and moderated session at APA's national convention in Washington.

Carrel Cowan-Ricks will be in this department as a part-time (49 percent) faculty member beginning in the 1992 fall semester. Her major contribution will be in the area of historic preservation. This year she will teach:

- Historical Archaeology
- Fort Hill Internship

She also will serve on graduate advisory committees in the department and conduct directed studies for planning majors. Her research and service include the following:

- On-going Ph.D. research

- Papers on Cemetery Hill Archaeological Project at Society for Historical Archaeology Conference and Archaeological Society of S.C.
- Old Bethel Restoration Project, McClellanville, SC
- Hunnicutt Cemetery Restoration and Indexing Project, Salem, SC
- Keese Barn Project, Pendleton, SC
- Editor, The Headstone, CU Archaeology Program Newsletter

Jim London received tenure this year. His teaching and research activities continued to be significant. Courses taught last year included:

- Quantitative Methods in Planning
- Planning Methods
- Environmental Planning
- Coastal Planning

In research, Jim completed solid waste management projects and participated in a proposal for a project that begins this fall on Impacts of Greenhouse Gas Emissions on China. He contributed service in the University Strategic Planning Committee on the Environment, Advisory Committee on Environmental Policy Project, Advisory Committee on Kellogg Research Development Initiative, and was an adviser to DHEC on solid waste management.

Barry Nocks spent a year of sabbatical leave at the Department of Health Administration of Duke University's Medical Center. He participated in research, taught a class jointly with Duke colleagues and made valuable connections in his field of expertise. Courses taught were:

- Strategic Planning
- Strategic Management

His research for the year focused on Analysis of Indigent Care Population in South Carolina.

Students/Recruitment

Enrollment in the 1992 spring semester was 57 full-time students. The last recruitment cycle which ended this summer yielded an all time high of 25 new students which have enrolled this August for a total enrollment of 60 full-time MCRP students. Two planning students will be in Genoa during 1992 fall semester.

Financial Aid

Last year the department received another HUD Work-Study grant that funded 10 new students for a two-year cycle. In total, there were:

- 14 — Graduate assistantship
- 11 — Public Service Assistantships
- 17 — HUD Work-study grants
- 42 — Students on financial aid (74 percent of a total enrollment of 57)

During last year new HUD positions were secured for students entering in fall 1992. Likewise, several PSA positions were negotiated, and we opened the 1992-93 year with the following:

- 19 Graduate assistantships\$33,000
- 12 Public Service Assistantships...\$45,280
- 20 HUD Work-study grants\$221,930
- 51 Students on financial aid\$300,210 (85 percent of a total enrollment of 60)

CHE Match

The initiatives of last year in the area of externally funded financial aid alone should result in a CHE match in the order of \$50,000 this year. The figure of financial aid expenditures this year (\$267,210) should generate a CHE match of \$67,000 for next year.

Landscape Architecture Program

Faculty

Marvolyn Alexander joined the faculty at two-thirds time while she works toward a MCRP degree. She represented the Landscape Architecture Program in the second year studios.

Professor Lolly Tai returned for her fourth year of work in the program. She sought and was granted the opportunity to teach the Charleston architecture/landscape architecture studio. She also taught courses at the College of Charleston. In addition, she brought great visibility for herself and our program by being selected to teach at the Governor's School for the Sciences the summer before and after her Charleston assignment.

Professor Frances Chamberlain returned for her third year of teaching at Clemson. She taught third year and fourth year design studios, history and theory of landscape architecture, and conducted a seminar on Theories in Landscape Architecture. She directed the 1990-91 Clemson Architectural Foundation Lecture Series and will do so again for 1992-93. Professor Chamberlain continued to serve, with college support, on the Review Board for the Journal of Architectural Education, a rare occurrence for a landscape architect. She used this opportunity to secure the editor of the journal as a CAF speaker for the coming year.

Adjunct Professor Scott Sonnenberg continued to teach a landscape architecture technology course in the spring. We intend to continue this valuable "contact" with practicing professionals for our students.

Both Professor Tai and Professor Chamberlain were reappointed for next year and continue to work toward tenure. It is imperative that Professor Sonnenberg be retained in his adjunct position.

Professor Don Collins continued to serve as program coordinator (The program remains assigned to the office of the dean). Professor Collins taught third and fourth year studios and second and fourth year technology classes in addition to his administrative duties. He especially welcomes Professor Tai's fall return and resumption of responsibility for the technology courses.

Staff

The program had only part time staff support, and this continued to be a significant problem. Steps have been taken to increase the staff time allocation for the 1992-93 year by moving Kim Mounter out of the reception area and allowing her to work for the Landscape Architecture faculty.

Students

Applications were as expected. The student body continued to grow. Matriculating students continue to be right on the numbers projected by Professor Jose Caban in his original data for the program. All students continue to meet the high standards for College of Architecture admission.

We stood at 61 students at the end of the year. For the coming fall semester, the University has admitted 19 additional new and transfer students. With the advent of a full-blown fifth year studio in the spring, visibility of the Landscape Architecture Program in the college will be enhanced further. The Landscape Architecture studios, however, may have to change location again due to the continued growth of the program.

The S.C. ASLA took steps to implement an awards program for our students in conjunction with the University's Honors and Awards Day program. This award,

given to a rising fifth year student, allows the recipient to attend the National ASLA annual meeting. Robert and Anna Lou Marvin established an endowment to assist a landscape architecture student going to Genoa. The Webel Foundation has made a three-year grant to the college for the same purpose. The \$1,000 CAF Scholarship was awarded to a rising fifth year student for the first time.

Twenty-two students and one faculty member, with some CAF support, attended the LABASH conference for landscape architecture students at the University of Texas at Arlington.

Public Service

Next year students and/or faculty will work on a number of public service projects. Many requests for public service projects fit very well into the landscape architecture studio environment and educational mission. The increasing size of the student body will allow us to do more in the way of public service projects from the list of contacts made through Professor Gayland Witherspoon's efforts.

Upcoming Events

The annual meeting of the Council of Educators in Landscape Architecture is to be held this year at the University of Virginia. With continued CAF support, all landscape architecture faculty will be able to attend. The LABASH conference will be held at California Polytechnic State University, San Luis Obispo. Students already are making plans to attend.

Future Needs

Space for the program next year will be an issue. We will need a studio to hold 35 students, 10 of whom will need a "double-table" work station. Additional faculty positions are essential for the following year to cover the number of courses that must be offered. A full-time, year-round program head and staff assistant are a must if the program is to live up to expectations and capitalize on opportunities. Adequate travel funding for student field trips and faculty development continues to be a priority area.

Conclusions

The program is lean but in excellent health. The students continue to be enthusiastic; the faculty remains so as well. Our major challenge continues to be the balance of new demands on time against the more traditional pursuits of creative teaching and professional development.

COLLEGE OF COMMERCE AND INDUSTRY

School of Accountancy

During the 1991-92 academic year the School of Accountancy had significant achievements in program development, faculty scholarship and professional service activities. The faculty of the school gave final approval to major revisions of the undergraduate and graduate curricula. The revised curricula incorporate expanded general education and business components and improved articulation of the undergraduate and graduate accounting courses. Work continues on revisions of course content and classroom pedagogy. Innovative teaching techniques including cooperative learning, expanded writing requirements and team assignments have been incorporated into a significant number of accounting courses. Placement of undergraduate and graduate accounting students continued to compare favorably with national averages. The School of Accountancy is recognized as a primary recruiting

school for major accounting firms, industry and governmental agencies in the Carolinas and Georgia. During the 1991-92 academic year the School of Accountancy graduated 116 B.S. students and 29 Master of Professional Accountancy students. Of the B.S. graduates, 14 percent graduated with University honors. Fall enrollment in the undergraduate and graduate accounting programs totaled 526 and 46, respectively. In November, the school announced the establishment of the Charles D. and Katrina M. Way Accounting Excellence Endowment Fund. This is the school's first major endowment and will provide support for innovative classroom teaching and course development. The endowment is made possible by a major gift from Charlie and Katrina Way of Greer. Charlie, a 1975 graduate of the School of Accountancy, is president and CEO of Ryan's Family Steak Houses, Inc.

Faculty scholarship continues at a strong pace. During the year the faculty had 16 journal articles and five books published or accepted for publication. Faculty presented 12 papers at regional professional meetings, four papers at national professional meetings, and one paper was presented at an international accounting conference sponsored by the University of Illinois. Faculty publications included articles in *CPA Journal*, *Internal Auditing*, *Review of Taxation for Individuals*, *Monthly Digest of Tax Articles*, *Journal of Business Ethics*, *International Journal of Accounting*, *Internal Auditor*, *Journal of Accounting and Computers*, *Broadcast Financial Journal*, *National Public Accountant*, *Journal of Small Business Management*, and *Business Forum*. Included in the faculty publications is *Keys to Understanding Social Security Benefits* authored by Professor Tom Dickens, which has received considerable national press as a clear, concise and informative presentation on this important and complex area. Professor Larry Clark was recognized during the spring semester with the School of Accountancy "Outstanding Teacher Award," selected and presented by the school's Student Advisory Council. The school's Beta Alpha Psi chapter of the national honorary and professional accounting fraternity earned Superior Chapter status for the 1991-92 academic year. This is the highest award a local chapter can receive from the national organization.

The internal auditing program continues to attract a significant number of students. The program has received outstanding support from the internal auditing professional community in manufacturing, retail and financial institutions. Placement of internal auditing students in permanent and internship positions has been excellent. During the 1992 summer break, 15 rising seniors participated in internship positions with corporations and agencies throughout the Southeast including Springs Industries, NationsBank, Sonoco Products, Duke Power, Blue

Cross/Blue Shield of South Carolina, First Union Corporation, First Savings Bank of South Carolina, SCANA, Liberty Life, Georgia-Pacific, and the Federal Reserve Bank.

In the professional service area, four faculty members are serving on national boards or committees of professional accounting organizations. Several continue to hold office in local and state chapters of professional accounting organizations.

Department of Economics

During the academic year 1991-92 members of the Department of Economics continued their efforts to increase outside funding for research. These efforts culminated in members of the department receiving grants from the National Science Foundation, the Department of Defense and the Earhart Foundation.

In addition, the department made important strides in its efforts to increase outside funding for graduate students in Economics. Through the efforts of William R. Dougan and Cotton M. Lindsay, Clemson and three other universities (Duke, Stanford and UCLA) are affiliates of the Advanced Training in Economics program funded by U.S.A.I.D. which provides funding for graduate students. Lindsay and Michael T. Maloney separately have negotiated U.S.A.I.D. support for generous fellowships to study Economics at Clemson. Additional recognition of the department's increasing distinction is indicated by Lindsay's receiving an Earhart Founda-

tion fellowship that he awards each year to a Clemson graduate student in Economics.

This year, the recognition of the department's emphasis on high-quality research reached a new peak. Members of the department had one or more papers accepted for publication or published in the top Economics journals, *The American Economic Review*, *The Journal of Political Economy*, *The Quarterly Journal of Economics*, *The Review of Economics and Statistics*, and the *Economic Journal*. With one exception, these are all of the most prestigious journals in Economics. In addition, numerous papers were accepted or published in more specialized journals, including two papers in the leading journal in finance, *The Journal of Finance*.

Our efforts to increase the department's and the University's visibility resulted in another record year for graduate enrollment, both in terms of numbers of students and in terms of their credentials. The increases in both research and funding have contributed to this important indicator of the department's distinction.

Reflecting the general decrease in undergraduate students majoring in liberal education majors such as Economics, the number of Economics majors has decreased over the last decade. In response, the department has begun to restructure the undergraduate program to increase the program's attractiveness and to increase the employment benefits of the degree.

The Center for Economic Education, headed by Dennis Placone, continued the department's mission of disseminating economic knowledge to non-economists. With funding from the National Science Foundation, Clemson and three other universities (Purdue University, the University of Minnesota and UCLA) hosted workshops for high school teachers of Advanced Placement courses.

Department of Finance

The Department of Finance continued to be among the nation's leaders in undergraduate finance education in 1991-92. With about 750 majors, the financial management program is among the largest majors at Clemson. Financial management graduates continue to be highly sought by firms throughout the nation. This is partly because these majors take a more rigorous program of accounting and finance courses than students in finance programs at any other university anywhere.

In the area of private financial support, S.C. National Bank and Wachovia National Bank together pledged \$300,000 to establish an SCN Professorship in Banking as well as a Wachovia Faculty Scholars program.

Clemson's finance faculty strives to conduct research that is both relevant in the world of business and valuable to students in the classroom. Much of this research has taken on an international flavor. Wayne Marr, First Union Professor of Banking, published three articles about Eurobond and other equity offerings in international markets. Scott Barnhart's paper on the stability of financial markets in the United Kingdom will be published in the *Journal of Banking and Finance*. Mike Spivey and others published an article on foreign takeovers of U.S. firms in *Managerial and Decision Economics*. John Harris published a substantial business handbook entitled *International Finance* for Barron's. Robert McElreath increased his understanding of international finance by teaching last year in Clemson's MBA program in Pordenone, Italy.

On the domestic front, John Alexander published a paper in *Financial Review* on how stock prices react to earnings announcements in the press that are surprisingly low or high. Neil Waller continued his research on maintenance and agency cost in rental housing and other studies ranging between the determinants of apartment rents to assessing tenant damages. He published his results in the *Journal of Real Estate Finance and Economics and Real Estate Appraiser*.

Next year the department will lose the services of Harold Mulherin to the Tuck School at Dartmouth. Tom Springer moved to Florida Atlantic University. New faculty will join us from other universities: Stuart Rosenstein from SIU and James Miller from Purdue University.

Department of Management

The Department of Management, under the leadership of department head, Dr. William H. Hendrix, continued to position itself for the 1990s. The department continued its Academic Total Quality Management efforts begun in the 1990-91 academic year with development of a departmental strategic plan.

Faculty developed the plan based on the vision statement created during the previous year. Departmental strengths and weaknesses were determined, broad goals were established, followed by the formation of specific objectives. The development process was iterative where input from the faculty was considered at each step in the process. Broad goals for the future include:

- improving academic programs and classroom instruction,
- improving the quality of our incoming and outgoing students,
- improving our reputation with the business community,
- improving our reputation among academic and professional institutions, and
- increasing the quantity and quality of research.

Goal one inspired faculty in the department to produce a Teacher Evaluation Questionnaire (now being used by one additional department and under consideration by other departments) which queries students enrolled in each management class as to their satisfaction with the teaching and their suggestions for improvement. This questionnaire, in addition to surveys administered to graduating seniors and alumni, indicate that departmental teaching effectiveness is quite high. Effectiveness also is indicated by the award received by Dr. Larry LaForge from the students of Calhoun College, the honors program at Clemson University, honoring him as Outstanding Honors Professor for the 1990-91 academic year.

The first goal also led to several workshops offered to faculty and graduate student teachers to improve teaching in the department. Dr. Jeff Harrison taught on how to manage the first day of class, Dr. William H. Hendrix on how to develop course objectives and Dr. Larry LaForge on how laboratory experiences could be valuable to students.

The second goal in the strategic plan motivated the development of a brochure describing our graduate programs. This brochure was mailed to leading universities around the United States and selected countries in an attempt to attract high quality graduate students.

Success in the area of goal three was indicated by the volume of external funding received by the department. Dr. Larry LaForge received a \$55,000 software grant from the Pritsker Corporation of West Lafayette, Indiana to support his ongoing manufacturing systems simulation in the Manufacturing Management Laboratory. Dr. John J. Kanet and Dr. V. Sridharan received \$30,000 from the McDonnell Douglas Space Systems in Houston, Texas for a project titled "Analysis of Non-Non-Delay Scheduling Methods" and \$185,862 grant from the Decision, Risk and Management Sciences Program of National Science Foundation to pursue their research in "Deterministic Order Release Planning."

In agreement with goal four, the quality of the faculty was recognized both internally and externally. Dr. J. Stephen Davis was promoted to professor. Dr. Tim Summers was awarded tenure. Dr. Caron St. John was promoted to associate professor. Externally, V. Sridharan was appointed to the editorial review board of *Production and Operations Management*, Dr. Terry Leap and Dr. Mike Crino were appointed to the editorial review board of *Journal of Managerial Issues*. Dr. Caron St. John was appointed to serve on the editorial review board of *Production and Operations Management*. In addition, Dr. John J. Kanet, Burlington Professor of Management, was awarded a Fulbright grant to conduct research in Germany.

Lastly, in accord with the fifth goal, research contributions by management faculty appeared in the best journals in the field, including *Decision Sciences*, *Strate-*

gic Management Journal, Production and Inventory Management Journal, International Journal of Purchasing and Materials Management, Human Relations, Academy of Management Executive, Journal of Social Behavior and Personality, International Journal of Physical Distribution and Logistics Management, Computer and Operations Research, Case Research Journal, Industrial Marketing Management, Managerial and Decision Economics, Transportation Journal; Group and Organizational Studies, Journal of Occupational and Organizational Psychology and many others. In fact, publications and presentations by department faculty numbered approximately 60 during the year. The textbook, *Strategic Management for Decision Making*, by Dr. D.W. Grigsby (With Michael J. Stahl) was published by PWS-Kent. Dr. Mike Crino and Dr. Terry Leap completed work on the second edition of *Personnel/Human Resource Management*, which will be published by Macmillan Publishing Company. *Collective Bargaining and Labor Relations* by Dr. Terry Leap also was published by Macmillan. Dr. Larry LaForge and Dr. Mark McKnew both were cited by the Decision Sciences Institute for their research productivity. They were two of only 16 individuals world wide who had four or more articles published in *Decision Sciences* since 1982. To a large extent, their research productivity resulted in Clemson University being listed as the third most productive University in the country with Ohio State University and the University of Minnesota respectively being number one and two.

Department of Marketing

During the 1991-92 academic year the Department of Marketing graduated 179 students with a B.S. degree. Marketing continues to be a popular major for undergraduates. Presently, the department has approximately 600 majors, making it the third largest department in the University. In addition, the department services approximately 600 students who are minoring in marketing. Marketing appears to be a popular minor attracting students from management, finance, economics, political science, recreation, and languages and international trade.

Two years ago, the marketing department revised its curriculum and adopted "niche" strategy. The department now offers its majors the option of concentrating in any one of the following areas: Technical Marketing, Services Marketing or General Marketing Management. New courses have been developed for the "Technical" and "Services" concentrations and will be offered to students in the coming academic year. Dow Chemical Company was so impressed with the "Technical Marketing" concentration, they gave the department \$1,000 for the purchase of Technical Marketing materials. In addition, Dow has created a scholarship which is to be awarded yearly to a student who has a Technical Marketing concentration. We still are working on a proposal for a master's program in Technical Marketing which we hope to submit for University approval this coming year. The department also is working with Development Office to seek external support for a faculty chair in Technical Marketing.

The department's research productivity was excellent once again in 1991-92. Faculty research was published in many of our discipline's leading scholarly journals including the *Journal of Personal Selling and Sales Management, Journal of Business and Industrial Marketing, Journal of the Academy of Marketing Science, Marketing Letters, Journal of Health Care Marketing, Journal of Public Policy and Marketing, Journal of Advertising, Journal of Business Research, Journal of Business Ethics, Psychology and Marketing, Journal of Marketing Education, Transportation Journal, Journal of Current Issues and Research in Advertising*, and the *Journal of Consumer Psychology*. Further, the faculty presented papers at all of our most prestigious meetings including the American Marketing Association Conferences, the Association for Consumer Research Meeting, the Academy of Marketing Science Meeting, the American Advertising Association Meeting, and the Services Marketing Conference. Two-thirds of the marketing faculty now serve on the editorial boards of scholarly journals; several hold offices in local, regional and

national marketing associations. In addition, several faculty received University research grants, and another faculty member received a teaching improvement award.

The marketing faculty continued to provide services to the University and the larger community as well. Two of the three representatives on the Faculty Senate are from the College of Commerce and Industry Council. Numerous others serve on various committees throughout the college and University. In addition, marketing faculty undertook studies to assist local and regional organizations including, but not limited to, the Greenville Chamber of Commerce, Savannah Valley Authority, Moore Development, Houston Transit Authority and numerous local businesses in the Greenville-Spartanburg metropolitan area.

Office of Professional Development

The Office of Professional Development turned in a record enrollment year in 1991-92 as it began implementing its nationwide strategy to offer more conferences and fewer seminars.

More than 22,000 people attended PD-sponsored textile and management conferences and seminars across the country even though the number of events offered dropped by 22 percent from 600 last fiscal year to 468 this fiscal year.

The most significant new event of the year was the inaugural PEOPLE conference held in Atlanta May 4-6, 1992. The Alliance for PEOPLE was the organization designed by PD to spearhead the conference, which attracted more than 300 human resource executives. PEOPLE is an acronym for The Promotion of Excellence in Organizations through Productivity, Leadership and Empowerment.

The conference featured six keynote speakers, four preconference workshops and 30 concurrent sessions. It was a phenomenal success as evidenced by numerous glowing evaluations, including these:

"I just returned to my office from attending the "Organizational Excellence" conference and wanted you to know of my great appreciation for the opportunity to participate. Your organization and planning to bring so many outstanding presenters together is what made this a truly outstanding event."

David E. Hosler, CPCU, president, Old Guard Insurance

"The concurrent program was excellent, but the keynote speakers alone made the conference a superior event. I highly recommend it as the best conference of this type I have ever attended."

Maurice N. Larrivee, chief,
Textile Chemistry and Camouflage
U.S. Army Natick RD&E Center

"The conference content and diversity in subject matter made this one of the most effective conferences that I have ever attended."

Stan Davis, manager, Engineering Services, TVA - NFERC

The keynote speakers were Stephen Covey (author, *The Seven Habits of Highly Effective People*), Harvey Mackay (author, *Swim with the Sharks without Being Eaten Alive*), Rosabeth Moss Kanter (editor, *Harvard Business Review*), Perry Smith (CNN military analyst during Gulf War and strategic planner), Peter Pestillo (Ford executive), and Daniel Burrus (technology futurist).

At the PEOPLE conference, President Max Lennon presented two 21st Century Organizational Excellence Awards, one to a small organization, Asten Press Fabrics in Clinton, and another to a large organization, Motorola Government Electronics Group in Phoenix. The awards committee, which included two Malcolm Baldrige Examiners, was chaired by William Hendrix, head of the management department.

E.J. "Pete" Nagele, an instructor in the management department and retired senior vice president of White Consolidated Industries, chaired the PEOPLE Advisory Group and provided much of the leadership necessary to implement the well-received conference.

Because of the initial conference's success, a second PEOPLE conference is already slated for May 24-26, 1993, in New Orleans.

Other highlights from the PD year include:

- Continued success in the textile and apparel conference markets with an attendance of more than 2,000 managers in 45 technical conferences.
- Successful textile conferences in Mexico in anticipation of the North American Free Trade Agreement. Two well-attended conferences were held as an alliance was formed with the Textile Chamber of Commerce in Puebla, Mexico, and the University of the Americas.
- Continued success in the Professional Development for Women conference markets, with increases in the number of conferences held nationwide (up to 48 this fiscal year from 35 last FY) and in enrollment (up 37 percent for a total enrollment of 11,009).
- Hit the highwater mark for enrollment in a Professional Development for Women conference in Minneapolis, with an attendance of 573 on May 4, 1992.
- Continue to expand the Quality Forum seminar series to equip the 20th century manager with the skill to fuse "quality" management with proper statistical technique and interpretation. In 10 two-, three-, and four-day seminars, total enrollment was 265.

Small Business Development Center

The Clemson University Regional Small Business Development Center continued to assist the small business community in the 11 Northwestern counties of South Carolina. Through its administrative offices located on campus and three area offices located in Greenville, Spartanburg and Greenwood, the SBDC has fostered economic development and growth in the Upstate. During the past fiscal year the Clemson SBDC has assisted more than 1,000 clients. Trends indicate that the Clemson SBDC operation once again will conclude the year in excess of annual goals. In addition the Management Training Division conducted more than 20 seminars on current and diverse small business management topics. The Management Training Division has cemented relationships with the local area Chambers of Commerce which has eliminated the duplication of seminars on similar topics.

The center's core program of management assistance and training is funded jointly by the U.S. Small Business Administration and the State of South Carolina. The core mission of the SBDC is to provide management and technical assistance to small businesses to reduce the small business failure rate. In addition the center administers a Defense Logistics Agency grant for the establishment of a state and federal procurement assistance program for small businesses. As a result of this program, now in its fifth year, several large procurement contracts have been awarded to small businesses in the Clemson area during a period of unprecedented growth for this program.

The Clemson SBDC assisted the S.C. SBDC and the USC School of Business Administration in training 10 small business development center directors for Poland and Hungary. The Scientex Corporation of Washington, an international consultant firm, has chosen the Frank L. Roddey SBDC to train this group in the free market economy and how to provide management and technical assistance to emerging and privatized firms in their respective countries. Two of the Clemson SBDC consultants have been chosen to represent the Frank L. Roddey SBDC and Clemson University in Hungary to provide additional training to the new directors.

The Clemson University SBDC, in partnership with the Southeast Manufacturing Technology Center at the University of South Carolina, is serving as coordinator between the colleges and universities of South Carolina which develop technology and the small business community. As a result, the close partnership with the Clemson University Emerging Technology Center remains strong. The new Energy Conservation Program now is accessible by all of our small-business clients. This program is designed to educate small businesses as to energy-saving techniques that may be implemented in day-to-day operations.

School of Textiles, Fiber and Polymer Science

During the 1991-92 academic year the School of Textiles graduated one Ph.D. student, three M.S. students and 30 B.S. students. Placement of these graduates continued to be high as in previous years, with all graduates being placed who sought employment. Enrollment in the undergraduate programs remained about the same as in the preceding year with 190 students enrolled in the three undergraduate programs. The number of graduate students enrolled continues to be limited by the funds available for assistantships. However, increased outside research funding for graduate students should alleviate this problem in the near future.

Sponsored research continues to receive emphasis in the school. Federal funding for the research consortium involving Auburn, Clemson, Georgia Tech and N.C. State was obtained. First year efforts resulted in 10 projects involving support for 11 faculty, six research associates and 13 graduate students. Significant equipment purchases also are included in the funds. Work also progressed in our efforts to bring together an alliance of fiber producers and machinery manufacturers along with Clemson to carry out research and machinery evaluations in the polymer fiber extrusion area. Several small startup grants were obtained as well as equipment to begin the work.

We have continued to enhance our laboratories through acquisition of equipment, mostly through donations. This serves both our research and teaching efforts.

The public service component of our mission has been well-supported this year with approximately \$138,000 billed to firms for special testing and small project/consulting efforts performed in our laboratory facilities. Numerous additional consultations were provided by the faculty on a no fee basis.

COLLEGE OF EDUCATION

The College of Education achieved measurable success during the 1991-92 year in the three traditional academic pursuits of teaching, research and service. In a variety of efforts incorporating grantsmanship, research activities, collaboration with school districts and other agencies, and strategic planning, the college marked notable improvement when compared with the previous year.

Included in the College of Education are the Departments of Elementary and Secondary Education, Industrial Education, and the Army and Air Force ROTC programs, as well as the Offices of Educational Research, Extension and Public Relations, Field Experiences, and Educational Services and Placement. Their respective summaries of accomplishments reflect a unified commitment to the college's priority on program enhancement and improvement.

Department of Elementary and Secondary Education

Instruction

The mission statement adopted by the Department of Elementary and Secondary Education includes the following:

- prepare teachers for employment in public, and/or private schools,
- provide graduate programs for educators and personnel of community and state agencies,
- engage in public service activities with educational entities and state and community agencies and,
- conduct research and scholarly activities related to public and faculty interests.

The department faculty have focused on all the areas of teacher preparation, continuing education conducted through graduate degree programs, extension courses, and in-service workshops as well as continued growth in research and scholarly activities. Faculty members have access to network computer equipment and are being trained to implement computer instruction into methods course, along with higher-order thinking skills and strategies for writing-across-the-curriculum program initiatives.

Expansion in the college has continued as reflected in student enrollment figures. There were 1,504 undergraduate students and 1,348 graduate students enrolled for spring. The department continues to serve a very able group of undergraduate and graduate students. The undergraduate students entering the department as part of the class of 1995 have an average SAT score of 972. The strong academic ability of this group also is evidenced by the report that 99.2 percent of them passed the Educational Entrance Examination during their first year at Clemson.

Bachelor of Arts degrees are offered in early childhood, elementary, secondary and special education. Science teaching is an additional undergraduate program granting a Bachelor of Science degree. Master of Education degrees are available in the areas of administration and supervision, counseling and guidance services, elementary education, reading, secondary education and special education. The administration and supervision program has an approved Specialist of Education (Ed.S.) degree program. Additionally, the Commission on Higher Education recently approved a Ph.D. in Curriculum and Instruction. Implementation is slated for January 1993.

The department continued its commitment to place undergraduate students in practical public classroom experiences. The first course in which education majors observe in the public schools, ED 100, had an enrollment of 534. Foundation and methods courses likewise provided frequent visits arranged for 658 students to experience the classroom environment. The early childhood and elementary field experience courses, ED 400/401, provided 181 undergraduates with similar extended experiences, and ED 496 provided nine students with special education field experience.

The Special Education program enrolled 28 students (undergraduate and graduate) in practica courses. The guidance and counseling program had 28 elementary and 23 secondary placements, 18 post-secondary placements, and 72 community agency placements in practica.

Administration and supervision provided practica for 20 students in ED 723 for the elementary principal, 21 students in ED 724 for the secondary principal, and five students in ED 725, a course for superintendents.

A proposal for a Ph.D. in Educational Leadership is currently under review by the Commission on Higher Education.

A consortium of universities and colleges focused on ways to assist elementary and secondary schools in the area of restructuring. Clemson was named college partner on eight restructuring grants submitted by area schools.

On the current topic of at-risk students, the "Visions for Youth" project, funded by the Kellogg Foundation, provided outreach programs aimed at the prevention of potential dropouts. Also, graduate courses on substance abuse were implemented to further educate teachers about drugs and alcohol. The Reading Recovery program centered at Clemson has been honored by the state. The program, a research-based approach to providing reading skills for children with identified deficiencies, is recognized internationally.

Inservice

The Clemson campus was the site for several educational conferences and meetings. The Clemson Reading Conference attracted more than 400 teacher educators, public school teachers and school administrators from the Southeast. Project L.E.A.D. sponsored a conference to improve leadership skills of school administrators. In another community-based activity 1,150 fourth graders from Pickens County participated in a Fun and Fitness Classic Day.

Through the Greenville Higher Education Consortium, faculty taught courses in various programs to area students. Similarly, critical needs and EIA courses were contracted with school districts and funded by the State Department of Education. In regards to local in-services, 16 sessions were conducted for educational personnel in the region. The department received an award from the State Board of Education in honor of its outstanding service to the state.

Research, Grants, and Related Activities

Faculty remained active with regard to publications. Twenty-one books, chapters or monographs were published by the faculty. Fifty articles, 35 of which were published in refereed journals, appeared in print. Thirteen unpublished articles and miscellaneous works also were submitted.

Presentations were conducted at many levels. Faculty presented at 24 national, 17 regional, 18 state and 21 local professional meetings.

Grantsmanship was evidenced by the 34 grants written. Nine of these proposals were funded, adding approximately \$3 million to the departmental budget during the life of the grants. Several faculty members participated in the development of grants.

Recruitment received notable attention by faculty representatives. Teacher cadet programs were established with five high schools, and a Future Teachers' Day was held in March for regional public school students and their counselors.

Department of Industrial Education

The Department of Industrial Education continued to make significant contributions toward its primary mission of instruction, public service and research. In instruction, the 17 full-time faculty, assisted by 10 part-time faculty, taught 53 different undergraduate courses and 41 graduate courses during the year. There were 200 classes with more than 2,600 students enrolled.

Faculty and students collaborated with schools and community in numerous ways, particularly in leadership roles in local and national organizations. Special services were rendered to schools, technical colleges and industry. in-service courses for teachers, administrators, and counselors as an orientation to industry were offered to several school districts. Institutes for vocational teachers, technology teachers and math and science teachers were held to update personnel in their areas. A special program designed to provide services for the printing and related industries attracted approximately 400 people to Clemson to receive specialized training in short, non-credit training sessions.

Two research grants were received by faculty during the year, with several additional proposals pending. Five training grants were awarded, and several more are pending for the coming year. A number of equipment grants in support of the technology program and for the graphic communications program were received. A

new electronic prepress center is being established, primarily through donations from the printing industry. CNC and CAD laboratories are being re-equipped for both basic and advanced students.

Department of Aerospace Studies

In the Air Force ROTC program, approximately \$131,695 went to 31 scholarship holders during the 1991-92 academic year, and 18 students were commissioned second lieutenants in the Air Force. AFROTC cadets participated in numerous projects to enhance campus awareness of AFROTC and to support the University's military heritage.

The cadet wing sponsored a relay run from Clemson to the University of South Carolina, along with a candle-lighting ceremony and an all-night vigil to enhance POW/MIA awareness. Cadets participated in greatly intensified physical training and leadership enhancement exercises to improve performance at Air Force summer camp, leading to the highest percentage of award winners and top-half performers in recent history.

Cadets and non-cadets in departmental organizations planned and executed a Dining Out and a Military Ball, playing host to hundreds of guests at these formal occasions with Air Force general officers as speakers. A student organization for the AFROTC unit, Angel Flight/Silver Wings, served as national headquarters for that organization. Angel Flight/Silver Wings and another AFROTC student organization, Arnold Air Society, were selected to jointly serve as region headquarters for Area Conclave for the coming year. These organizations continued to be very active and successful, winning more awards than any other detachments in the region. Cadets participated in other departmental organizations, including Pershing Rifles and Scabbard & Blade.

Department of Military Science

The academic year 1991-92 was filled with highlights for the Department of Military Science (Army ROTC). Eighteen students were commissioned second lieutenants. Fifty-five scholarships were provided by the U.S. Army, amounting to \$275,000.

During the fall and spring semesters the Fightin' Tiger Battalion acted as track meet referees for all the track and field competition events held at Clemson. High praise was earned from the participating coaches for this activity.

The department has an outreach program to three local high schools which sponsor Junior ROTC programs. These schools obtained superior ratings on national inspections during this period. Department organizations (Rangers, Pershing Rifles, Scabbard & Blade) continued their service-oriented projects.

Office of Educational Research

External/Internal Submissions

Thirty-five proposals for external funding and four proposals for internal funding were submitted from the College of Education during the 1991-92 fiscal period. More than half were authored by writing teams of two or more faculty members, with 28 separate faculty serving as P.I.'s. Approximately 75 percent of the faculty of the college have been involved during the 1992 fiscal year in the preparation of proposals. This level of participation is up from about 30 percent in 1991.

While the number of proposals submitted during the 1992 fiscal year was slightly less than the number submitted in 1991, the percentage of proposals funded increased from 48 percent to 63 percent. More significantly, the percentage of requested dollars actually obtained was 60 percent. This is a high percentage and reflects very positively on the quality of our recent applications and the positive rela-

tionships which faculty are developing with potential sponsors. Most notable among the large funded proposals was the Bio Com project (\$2.5 million) authored by Dr. Leonard, research equipment grants to the Department of Industrial Education authored by Drs. Pate and Crouch, and the Workplace Literacy Project developed by Dr. Fisk.

In addition to those proposals funded, several proposals were recommended for funding, but failed to be ranked high enough among competing proposals to be funded. These faculty efforts also are very much appreciated and serve to provide positive visibility among potential sponsors.

External/Internal Awards

Although comparison figures for the most recent fiscal period (1991-92) are not yet complete, it appears that the College of Education has risen from last to among the top 10 percent of comparison colleges for 1991-1992. The median annual funding level for comparison colleges seems to hold steady at about \$1,075,000, while Clemson's College of Education generated \$4,460,414 during the 1991-1992 period. This figure is four times the projected median for the comparison colleges.

Office of Educational Services and Placement

The Office of Educational Services and Placement continued to expand both the scope and breadth of its activities. The fifth annual Clemson University Teacher Interview Program (CUTIP) resulted in record numbers of participants, including 80 school districts from six states, 350 attendees and approximately 2,000 interviews. CUTIP was held in Littlejohn Coliseum this year due to the increase in numbers.

Workshops and seminars were offered in the fall and spring semesters to all undergraduates, providing information on resume writing and certification (in-state and out-of-state). Student teacher in-service workshops were conducted in the fall and spring semesters for graduating seniors and program completers, featuring information on interview etiquette and interviewing techniques. District personnel from eight local school districts (principals, personnel directors and superintendents) gave information on what is expected from a first-year teacher, interviewing techniques and district hiring practices.

The annual survey of student teachers and their classroom supervising teachers reflected a strong, positive attitude of University graduates toward the education, preparation and training they received in the College of Education. With a 77 percent response, results in both the fall and spring surveys were rated predominantly outstanding to excellent on the effectiveness of the teacher education program.

The Office of Educational Services and Placement also revamped its placement file system. In the past, identical forms were used by all individuals participating in the placement file system. In 1992-93, individuals will tailor-make their placement file to suit their individual needs.

The office also processed more than 1,500 applications for certification, fingerprint cards, checks, and transcripts for initial and add-on certification both in-state and out-of-state. It should be noted that of the 298 teaching preparation program graduates, only 10 undergraduate students did not meet all preprofessional standardized testing requirements for S.C. teacher certification. This performance allowed the college to report that 96.6 percent of all teacher preparation program completers were eligible for teacher certification in their area of specialization.

Office of Extension and Public Relations

In its continuing commitment to expansion and enhancement of the off-campus program and its role as an enrichment and outreach component of the College of Education, the Office of Extension and Public Relations reflected measurable suc-

cess in its 1991-92 operations. During the year a total of 280 courses were offered at various sites throughout the state as well as in Georgia. Those courses provided undergraduate and graduate instruction not only in professional education but also included such academic areas as mathematical sciences, industrial education, agriculture, nursing, economics, vocational technical education, English, forestry, and management.

The off-campus program provided 123 courses during the fall 1991 semester, with 1,336 students enrolled; 88 during spring 1992 with 1,310 enrolled; and 69 courses during the two summer sessions of 1992, with an enrollment of 790. Those offerings included courses that constituted a regular part of the degree-program curriculum at the University as well as those designed especially to meet specific needs of individual school districts and other agencies. Regional centers for providing off-campus courses on a regular cycle are maintained in Greenville at the University Center on the Greenville TEC campus and at Greenwood at Piedmont TEC.

In addition to providing off-campus course offerings, the office has responsibility for public relations efforts emanating from the College of Education, including ongoing publicity for academic activities such as conferences and meetings as well as individual faculty projects and endeavors. Each fall and spring, the office publishes *The Clemson Educator*, a newsletter for alumni, friends and other supporters of the College of Education.

Office of Field Experiences

The Office of Field Experiences during 1991-92 placed a record 1,974 students, a 21.7 percent increase in placements over the previous year. A variety of pre-student teaching observation/participation experiences were arranged for 1,467 students; student teaching placements were made for 301 students; and practice placements numbered 137, with 11 at the undergraduate level and 126 at the graduate level.

Thirty-six teachers received APT (Assessments of Performance in Teaching) training through participation in one of the three-day sessions scheduled during the fall and spring semesters. One other teacher gained re-endorsement as an APT observer by participation in a one-day training session. The survey of student teachers and supervising teachers reflected a high level of satisfaction with the supervisory processes used by the college supervisors in their observations and evaluations of student teachers. Seventy-four percent of the students and the classroom teachers responded to the survey for the fall and spring semesters.

COLLEGE OF ENGINEERING

Along with continued advancement in education, research and public service, the academic year 1991-1992 was highlighted by two notable events for the College of Engineering.

The first was the state approval of the Engineering Innovation Building, the first state-funded engineering building at Clemson in more than 22 years. Almost \$14 million was included in the bond authorization bill for Clemson's \$18 million engineering building. The difference was raised through private donations and campaigns, most notably the \$2.8 million raised by Fluor Daniel employees and its foundation. With a gift of this magnitude, the building has been named the Fluor Daniel Engineering Innovation Building.

The primarily research-oriented facility will be home to undergraduate and graduate research laboratories from the Department of Electrical and Computer Engineering and the Department of Mechanical Engineering. Included in the 100,000

square-foot facility will be faculty and departmental offices, a 120-seat seminar room, and offices for the Center for Advanced Manufacturing. These departments and labs presently are located in six different buildings, including Riggs Hall and Freeman, which, because of age, are in desperate need of major renovations.

With the bond bill draw schedule established, construction is expected to begin in the fall of 1992 on the new facility, with plans for it to take two-and-a-half years to complete. Yet, once this new facility is occupied, the college still will be 20 percent below in space allocation, compared with national peer engineering institutions. To remedy this situation, plans are under way for another engineering building which primarily will be dedicated to teaching.

Another event was the naming of the engineering dean, Dr. J. Charles Jennett, as provost and vice president for academic affairs for Clemson University in December 1991. While Dr. William B. Barlage, associate dean of engineering for instruction, served as acting dean, a national search was conducted for a new engineering dean, and more than 90 individuals applied or were nominated for the position. A final field of six candidates was selected, and on June 22, 1992, Dr. Thomas M. Keinath, head of Clemson's environmental systems engineering department, was named to the position. Dr. Keinath began his duties on July 1, 1992.

Other major highlights from the nine academic departments during the past fiscal year included:

- In the Department of Agricultural and Biological Engineering, the first group of students to move completely through the new agricultural engineering curriculum graduated in May 1992. Indications are that the specialized education received in the four emphasis areas is being well-received by employers. Enrollment is trending upward in the program with around 20 sophomores projected for fall 1992.
- Since the beginning of the program in 1962, the faculty of the Department of Bioengineering had decided — and many times confirmed — to focus on the bioengineering subset of biomaterials. Accordingly, the graduate curriculum has undergone major changes. Originally, graduate courses developed out of individual faculty interests and followed local or national research trends. During the past three years, however, a comprehensive curriculum evolved with the goal to broadly cover the research field of biomaterials from two basic angles: a. methodological approach, and, b. medical /surgical application.
- In the Department of Ceramic Engineering, through the efforts of Dr. R.J. Diefendorf, Du Pont donated research equipment worth in excess of \$1.2 million. Clemson University purchased all patent and technology transfer rights associated with the equipment. This will allow Clemson to provide commercial licenses to industry as new fibers are produced and characterized. Dr. Diefendorf and his students are setting up several programs to use the equipment to develop new high performance ceramic fibers for next generation use in composite materials.
- The Department of Civil Engineering now has a new facility at the Raveland Center Site which houses the new 100' long wind tunnel. This state-of-the-art tunnel has a cross-section measuring 10' wide by 6.5' tall and simulates hurricane wind loads. This new facility also will be home to Brerwulf, a research apparatus capable of simulating sudden bursts of positive and negative pressure on building facades and roofs to realistically simulate actual field conditions, making Clemson the only educational institution in the United States with such an apparatus. These facilities and equipment were obtained through funding from the Federal Emergency Management Administration.
- Some of the most active areas of research concentration in the Department of Chemical Engineering are supercritical extraction, stereolithography, membrane separations, the spinning of carbon fibers and the properties of

the fibers and their composites, catalytic dissolution of aluminum nuclear fuel rod casings, and process simulation and control.

- In the Department of Electrical and Computer Engineering, Professor Michael Pursley, an authority on spread-spectrum communications systems, joins us as the Holcombe Chair of Electrical and Computer Engineering. His addition will bring new focus to the department's existing communications/signal processing group. Spread-spectrum technology is a leading contender for the next generation of personal (portable) communications systems. Capability in this technology, along with the department's existing base in computer networks, is key to Clemson's leadership role in communications as we move into the 21st century.
- The Department of Environmental Systems Engineering moved to its new facilities at the Clemson Research Park and dedicated the building to the department's founder and former college dean, Dr. Gene Rich. The building was made available due to a joint \$10 million research initiative with Chemical Waste Management, Inc.
- The Department of Industrial Engineering has been an active participant in the University's total quality management efforts. Some of the benefits that have come this past academic year as a result include an increase in the design content of the undergraduate curriculum, additional equipment and space for manufacturing and quality laboratory sessions, and new graduate program operating procedures. The Eastman Chemical Company has provided extraordinary assistance for the department's continuous improvement efforts through a grant award for laboratory equipment purchases and curriculum development, and through interactions with an Eastman consultant who has served as an adviser to the faculty on quality management issues.
- A very significant benchmark was reached this year in the Mechanical Engineering Department when Dr. David A. Zumbrunnen was selected by the White House for a Presidential Faculty Fellow Award, a new honor that recognizes exceptional leadership in both teaching and research. He was among 15 engineers and 15 scientists selected nationally for the award.

Other college-wide programs had similar success stories during the past year:

- The Office of Continuing Engineering Education, one of the primary public service branches of the college, had more than 2,500 people attend its various short courses, seminars and conferences, including sponsorship, along with the Greater Greenville Chamber of Commerce, of a conference on environmental law and technology, drawing 210 participants and featuring U.S. Senator Fritz Hollings.
- As one part of the Minority Engineering Program, the Program for Engineering Enrichment and Retention (PEER) has seen better than 75 percent of the original PEER students (the class entering in 1987-88) graduate or are continuing to pursue college degrees. One third of the original PEER cohort has graduated or will graduate in engineering by August 1992. Another 10 percent has graduated in other disciplines. Similar achievement in future PEER cohorts will assure the Clemson Minority Engineering Program's place as one of the most successful retention efforts in the nation.

We also were pleased to discover that PEER seems to have a positive effect not only on new students, but on those who serve as PEER mentors as well. We found that 25 percent of the mentors have chosen to continue schooling beyond the bachelor's degree. Of the 48 students who have served as mentors, 12 currently are pur-

suing or have obtained advanced degrees, eight in engineering fields. Three of these exceptional students are candidates for the Ph.D. in engineering.

- In the area of development, gifts and pledges to the College of Engineering totaled an unprecedented high of \$9.3 million in the fiscal year ending June 30, 1992. This included \$5 million in cash and equipment received, compared with \$4.2 million the previous fiscal year. New pledges totaled \$4.3 million, up from \$3.8 million pledged the previous year.

In addition to the Fluor Daniel campaign, which was the largest in University history, other corporate matching-gift campaigns were conducted at Exxon Corporation to create an endowed chair in engineering and at Carolina Power & Light Company to create an endowment in power engineering.

- As part of the Engineering Computer Operations, more than 100 Unix workstations have been installed in public access computer labs in the college. Coupled with state-of-the-art design software like SDRC I-Deas, Ansys, Valid Logic and Mentor Graphics, the undergraduate engineering student is learning the skills needed to be competitive in today's job market.
- One of the major components of the Freshman Engineering Program is academic advising and counseling. Most counseling and advising concerns academic matters and common problems associated with the change from high school to university studies. Referrals are made to professionals for more serious adjustment problems. An effort to make freshmen aware of the assistance available in Freshman Engineering is beginning to pay dividends: in 1991-92 about 350 students per month met with advisers, as compared with about 250 visits per month the previous year.
- In the Engineering Analysis Program, students can "develop" their own major during their engineering studies. Most of the graduates are continuing to work in their areas of concentration and two-thirds of the graduates are pursuing advanced degree work, indicating that the program is meeting its desired objectives. Those pursuing advanced degrees include three studying bioengineering, management and environmental systems engineering at Clemson and another pursuing a law degree at the University of Mississippi; others have taken employment with Monroe Shock Absorber Co., in Anderson and an environmental engineering practice in New Hampshire.
- The Division of Engineering Services has identified and begun to assemble an island of machine tools to process carbon composite samples into test specimens for materials research in the College of Engineering. Bolstered by the college's investment of \$30,000 in a surface grinder for composites, our facility soon will be a reality.

During the 1991-92 year, the College of Engineering was the largest college on the Clemson campus, with 3,311 undergraduates and 708 graduate students enrolled. The college granted 530 Bachelor of Science degrees, 174 Master's degrees and 26 Doctoral degrees.

Other highlights of the past year included:

- Active research contracts climbed to \$20.7 million, with new research awards of \$7.3 million and \$8.9 million in research expenditures. Some 115 faculty members were involved in research projects, with 146 new projects being funded in the past fiscal year.
- The Clemson Camshaft generated positive publicity for the College of Engineering. The new automobile camshaft system, co-invented by Professor Emeritus of Mechanical Engineering Alvon Elrod and ME graduate

Tim Nelson, improves fuel economy by 20 percent and reduces pollution, according to laboratory tests.

- Dr. Harry Law, ME professor, received one of the Arch T. Colwell Merit Awards from the Society of Automotive Engineers.
- Dr. Tah-teh Yang, ME professor, continued to work on a technology that will generate clean electricity from coal.
- Dr. Dennis Powers, BioE professor, received an award at the Academy of Surgical Research and also assumed the presidency of this academy.
- Clemson and Hiroshima University of Japan established an exchange program allowing students and professors to spend time to experience other cultures and technologies. The program is being funded by the Urakami Foundation and the Ryobi Corporation.
- Dr. Ben Sill, CE professor, was awarded a \$1.73 million grant by the Federal Emergency Management Agency to develop South Carolina's defense against hurricanes and earthquakes.
- Dr. Steven McCutcheon, CE assistant professor, was named the Environmental Protection Agency's "Engineer of the Year."
- Drs. Denis Brosnan, Judd Diefendorf and Gordon Lewis, CrE professors, were named Fellows of the American Ceramic Society.
- David Dutterer, ME student, was named the Outstanding Member of the American Society of Mechanical Engineers.
- The College of Engineering was one of nine schools selected to participate in a five-year, \$30 million project funded by the National Science Foundation. The Southeastern University and College Coalition for Engineering Education, or SUCCEED, will work to dramatically overhaul engineering education at the undergraduate level.
- Dr. Scott Schiff, CE assistant professor, was awarded the 1992 Norman Medal by the American Society of Civil Engineering.
- Dr. Wayne Bennett, associate dean for research and external affairs, received a "Distinguished Service Award" from the National Electrical Engineering Department Heads Association.
- Dr. Craig Adams, ESE assistant professor, was the only S.C. professor among the 202 scientists and engineers selected in the United States as a NSF Young Investigator Award recipient.

COLLEGE OF FOREST AND RECREATION RESOURCES

The report of 1991-92 activities for the College of Forest and Recreation Resources' academic, research and Extension programs is included under the Division of Agriculture and Natural Resources on page 115.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts continues to subscribe to the notion that no university ever will achieve greatness without a strong program in the humanities, performing arts and social sciences. In addition, the college continues to subscribe to the notion that a self-governing society requires of its citizens a basic and general education that will enable them, regardless of the career paths they follow, to lead full and thus useful lives, and to contribute to the general welfare of society.

To provide its alumni with timely information about the college and its activities, the college continues to publish its newsletter, *Liberal Arts News*, which is edited by a member of the English faculty and normally is published twice yearly. The Department of English also publishes two newsletters of its own: the *Communications Across the Campus Newsletter* and *The Ruminator*, both of which are desktop published on the premises.

While the undergraduate student population at Clemson rose 33 percent in the last decade, undergraduates majoring in the liberal arts rose 128 percent. The faculty of the college teach approximately one-quarter of the credit hours taken by students; and, of the 38 semester hours needed to complete the University's "general education requirement," the college contributes nearly all of the courses for 21 of these hours.

The College of Liberal Arts consists of the departments of English, History, Languages, Performing Arts, Philosophy and Religion, Political Science, Psychology and Sociology. Except for Performing Arts, all departments offer majors leading to the Bachelor of Arts degree. English and History offer the Master of Arts degree; Psychology offers the Master of Science in Applied Psychology; Sociology offers the Master of Science in Applied Sociology; Political Science offers the Master of Public Administration in conjunction with the University of South Carolina at Columbia; and the newest graduate program, the Master of Arts in Professional Communication, was approved this year to be offered beginning in fall 1992 by the Department of English.

More than 90 percent of the tenured and tenure-track Liberal Arts faculty hold the doctoral or other terminal degree. Graduates of the college enter some of the country's outstanding graduate and professional schools; many of the graduates pursue careers in business (including the service industries), industry and government upon earning their degrees from the University.

Faculty Highlights

Several highly respected journals emanate from the College of Liberal Arts. *The South Carolina Review* is edited and published by faculty members in the Department of English. This distinguished magazine, whose contributors have earned a number of awards, provides a forum for literary scholarship and criticism, as well as for outstanding poetry and short stories. *The Upstart Crow: A Shakespeare Journal*, which also is edited and published in the Department of English, features scholarly articles from eminent Shakespeareans on all aspects of Shakespeare: his life, the editing of the plays and poetry, dramatic and film productions of his plays, and the interpretation and teaching of his work. With an international editorial board under the leadership of a faculty member in the Department of Political Science, *The Journal of Political Science* boasts a list of authors from leading colleges and universities from this country and from overseas. This journal emphasizes the scholarly contributions of younger researchers and addresses themes that appeal to a broad range of scholars, not merely those in political science. This year's issue, for example, was devoted to "Political Biography."

Liberal Arts faculty also continue to be extremely active in scholarly and creative endeavors. They deliver papers at numerous regional, national and international meetings and conferences; they contribute articles, poetry and fiction to a variety of established and influential journals; they edit book-length collections and prepare textbooks; they are active in musical and dramatic performances; and they write books in their areas of expertise that are issued by respected publishers and that receive favorable notices in the press. For example, members of the English faculty published 12 books this year and one prize-winning documentary film on Hurricane Hugo, which will be aired on S.C. Public Television this fall. Members of the History faculty published four books, while a total of five book manuscripts were accepted for publication by members of that faculty. Two members of the Political

Science faculty won prestigious research fellowships from the Olin Foundation and the Twentieth Century Fund.

A member of the Department of English received the prestigious Class of '39 Faculty Award for Excellence, now in its third year of being offered, with two of the first three recipients coming from English.

Recognizing the globalization of the economy and the emergence of a new political order, a Political Science faculty member taught a course in international relations in Spanish.

In addition and as further acknowledgment of the recognition faculty members in the College of Liberal Arts are receiving, they often hold positions as officers and as board members of a number of professional organizations and societies. For example, a Political Science faculty member chaired the J. William Fulbright Foreign Scholarship Board. A Performing Arts faculty member served as Administrative Vice President for the Southeastern Theatre Conference New Play Project, while another faculty member in that department served on the National Selection Team for the American College Theatre Festival. The Selection Team chose the bill of productions for the national festival at the John F. Kennedy Center for the Performing Arts in Washington from more than 800 participating productions. Too, the faculty serve on editorial boards in their areas, as manuscript referees for publishers and as evaluators of grant proposals.

Other departmental activities include, but are not limited to, the following: a book review service originating in the Department of English that specializes in children's books; research conducted by the Department of Psychology in a variety of topics such as aging, industrial safety, stress management, computer-assisted instruction, artificial intelligence, consumer behavior, decision-making strategies, the development of pattern vision in children, eating disorders and substance abuse; and research conducted by faculty in the Department of Sociology encompasses several areas including police violence, parental grief, child abuse, children's responses to crises, alcohol consumption, abortion, homelessness and the sociology of emotions.

Regular features of the College of Liberal Arts include gatherings of scholars and creative writers. For example, this year the Department of English hosted two scholarly conferences which drew a combined audience of more than 300 academics from throughout the country, The Philological Association of the Carolinas meeting in March and the Society for the Study of Southern Literature meeting in April. The Department of English continued to host the Southern Circuit Film Series, which brought independent filmmakers to the campus to show and discuss their works. The Departments of Performing Arts and English co-sponsored the first annual Clemson Shakespeare Festival in early March. The week of activities featured full productions of four of Shakespeare's plays by three different companies including the traveling players of the Royal Shakespeare Company. Approximately 10,000 people attended the productions, the film festival of selected plays and the public lecture series given by five internationally prominent Shakespeareans. The Department of History co-sponsored a lecture series entitled "Sailing Beyond the Myths" in commemoration of the Columbus Quincentennial with presentations by four eminent historians.

In addition, the Department of English played host to the third campus-wide Master Teacher in Residence, James Cox, distinguished professor emeritus, Dartmouth College, for three very successful weeks of classes, seminars, lectures and workshops.

Public Service

The public service roles played by the College of Liberal Arts throughout the state and region continue to experience significant growth. Political Science faculty are frequently called upon by units of state and local government for advice in such areas as poll-taking, taxation and government organization. In addition, political

scientists often serve as panelists for civic organizations and as consultants to both the print and electronic media on national and international affairs.

Sociologists contribute their expertise in such areas as the design and analysis of social surveys, leadership, the impact of industrial development on society, as well as in program development and evaluation in the fields of prison reform, spouse abuse, child custody, mental health, and alcohol and drug problems. Faculty in Sociology also offer workshops in staff growth and development for both private and public service agencies. Graduate students in Applied Sociology provide analyses of operating structures of public service agencies, community needs assessments and research in drop-out prevention. Psychologists continue to serve as consultants to the Southeastern Managers Network, an information sharing organization of senior managers representing more than 20 area businesses and industrial concerns. Psychologists also continue to provide consultation on jury selection, eyewitness validation and expert witnesses on criminal sanity. Graduate students in the Applied Psychology program provide a wide spectrum of services, including training, personnel selection, job analysis, and labor-management relations to area industry and businesses. With the assistance of a grant from the Self Foundation, the Department of Psychology developed a course designed to teach Statistical Process Control techniques, which increase efficiency, quality control and accurate process recording for a wide range of business and manufacturing applications. Offered on campus, the course is directed at line workers and first line supervisors in business and industry. English faculty members conduct seminars and workshops in business and technical writing. One English faculty member was selected by the S.C. Arts Commission to be on the S.C. Readers Circuit for 1991-92.

In conjunction with its traditional language programs, the Department of Languages has sponsored since 1971 an annual Language Declamation Contest for high school students of modern and classical languages. This year's contest drew more than 600 participants from South Carolina and nearby states. In the summer of 1992, the department sponsored study abroad programs to France, Germany and Spain. The Department of Languages also recognizes that it has a special mission in a world becoming more internationalized with each passing year. Given the large foreign investment in S.C. industry and the need to develop overseas trade markets, the department's Language and International Trade major represents an apt response. An important component of this major is its required internship program. This summer 35 Language and International Trade majors represented Clemson in six foreign countries: Costa Rica, Mexico, Ecuador, Venezuela, France and Germany. In addition, 15 students studied abroad during the spring 1992 semester. Graduates of the Language and International Trade program now are working throughout the eastern United States, Europe and Asia, and are employed, for example, by such companies as Synair (Tennessee), Disney World (Florida), Tiffany's (New York), Leslie Evans Creatives and Delta Airlines (Georgia), South Carolina National Bank (South Carolina), EuroDisney (France), Walt Disney Attractions (Great Britain), Pitney Bowes (Germany) and FIA (Japan).

Among the continued recipients of the college's public service activities are the state's schoolteachers. Improved civic education in the state's public schools is the goal of the Thurmond Seminar which is conducted by the Department of Political Science with funds from the Strom Thurmond Center for Government and Public Affairs. Twenty social science teachers from the state's secondary schools participated in this summer's seminar, with classes held both in Clemson and Washington, D.C. Liberal Arts faculty held a summer institute on campus for Advanced Placement (AP) teachers in U.S. History.

The Bread Loaf Rural Writing Network, Middlebury College's Bread Loaf School of English and Clemson's Department of English continue their partnership in administering grants to teachers and students in several public schools in the state. Piloted by the Bread Loaf Rural Writing Network in South Carolina, Project REACH (Rural Education Alliance for Collaborative Humanities), which is funded

by a Rockefeller Foundation grant channeled through the S.C. Humanities Council, operates out of a base in the Department of English.

The Bingham Trust continued to fund two programs, Writing in the Schools and Performing Across Cultures, which are collaborative ventures between the University and the secondary schools to improve writing and to foster cultural awareness. Additional outreach activities include faculty from the Department of Performing Arts serving regularly as judges for competitions in such areas as music and theatre in the region and state. In addition, "Theatre for Young Audiences," a touring theatre company made up of University students and faculty, along with townspeople, under the direction of a Theatre faculty member, presented 30 performances in the public schools of Pickens, Oconee, Anderson and Greenville counties. Also, the Music Preparatory Program of the Department of Performing Arts expanded this past year to include music therapy as an offering in addition to Kindermusik and Suzuki instruction.

The College of Liberal Arts serves the entire student body in a variety of ways other than through direct classroom instruction. For example, the Model United Nations Program, which is sponsored by the Department of Political Science, competed in and won awards at conferences at Appalachian State University and the University of North Carolina at Charlotte, and at the American Model United Nations in Chicago. Political Science also sponsors the State Student Legislature and the government internship program, the former involving an annual competition in Columbia and the latter involving students participating in local, state and national government. The Department of Performing Arts sponsors "New Plays Premiere," which showcases each summer new work by student playwrights. The Department of English operates the Writing Laboratory, which is available at no charge to all students on campus with writing deficiencies.

The college also contributes to University life by supporting a number of student organizations and extracurricular activities. For example, Performing Arts oversees a newly formed performance group, the Minority Tigers of Clemson, and the Clemson Players, the student drama group that stages four plays during the academic year and two during summer school. Some of its productions have received regional and national recognition. Many musical activities also are under the direction of Performing Arts: the University Concert Series, Robert and Lillian Utsey Chamber Music Series, and student organizations including Tiger Band, Symphonic Band, C.U. Chamber Orchestra, University Chorus, Chamber Singers, C.U. After Six Singers and Jazz Ensemble. The Department of English provides faculty advisors for two student publications: *The Chronicle* and *The Tiger*, the weekly student newspaper that has earned a number of collegiate awards.

Program Development

The R. Roy and Margery W. Pearce Center for Professional Communication continued to co-sponsor many activities in the Department of English, including the Bard College Writing Program, which was made possible by a grant from the Bingham Trust, as well as the Career Workshop program for minority students.

The College of Liberal Arts Advisement Center, which began operations in the summer of 1988, has as its principal activity the academic advisement of nearly 300 undergraduates enrolled as Liberal Arts (Undeclared) majors, a category designed for students who have not yet decided on a major area of study and are in the process of exploring academic options.

In conjunction with its freshman English program, the Department of English brings to campus each year a notable writer. This year the National Book Award winning novelist, John Knowles, visited the campus and gave a public address. Freshman composition classes read his novel, *A Separate Peace*.

The Language and International Trade undergraduate major continues to represent one of the significant bridges erected by the College of Liberal Arts to span the gap between the liberal arts and the scientific and technological disciplines on cam-

pus. This major joins Liberal Arts with the colleges of Agricultural Sciences, Commerce and Industry, and Forest and Recreation Resources in a most successful interdisciplinary effort.

Another continuing and successful interdisciplinary endeavor, Communication Across the Curriculum, which is housed in the departments of English and Performing Arts, involves all nine academic colleges in the communal goal of improving the writing skills of students.

The Department of Psychology's Master of Science degree in Applied Psychology with tracks in both human factors and industrial/organizational psychology has completed a very successful fourth year. Its graduates are in demand by both regional and national companies.

Significant progress continues to be made on the remodeling of Brackett Hall, which will house the social science departments of Political Science, Psychology and Sociology. Psychology already is in its new quarters, and the two other disciplines plan to make Brackett their home in the 92-93 academic year. The Robert Howell Brooks Center for the Performing Arts is under construction, with an occupancy date targeted for the summer of 1993.

COLLEGE OF NURSING

The College of Nursing has demonstrated continued growth in its academic, professional service and research programs during the 1991-92 academic year. Enrollment in the undergraduate programs has increased significantly. The college continues to provide services to the community through a variety of professional activities. Significant support for college programs is being derived from overall college development activities.

Administration

Dr. Opal Hipps, dean, provided leadership for the achievement of the college mission. The Department of Nursing Science offers all academic course work leading to a baccalaureate degree or a master's degree with a major in nursing. A Bachelor of Science degree in Health Science was approved in December 1991. This program is administered by the new Department of Health Science, which was made operational in July 1991.

The college continues to serve the community and citizens of South Carolina through the Department of Continuing Education and the Department of Professional Services.

The Office of Development in the College of Nursing is responsible for attracting support of constituent groups through innovative and creative programming and writing to encourage gifts focused on college priorities. This mission is advanced through three basic components: fund-raising, alumni relations and public relations.

The College Development Board was expanded with the addition of two new members: Mr. Roddey Gettys III and Mr. Stanley Riggins. Cash gift activity has increased by 247 percent since 1989-90 to \$218,825 for 1991-92. The largest increase was in endowed programs for the college. Of special note is a gift from the Greg Hughes family. New scholarship programs include the Oliver Kent Cecil Scholarship, the Aileen Prevost Scholarship, C.A. and W.A. Smith Scholarship, and the William and Joan Kennerty Scholarship. Gifts of equipment for 1991-92 are valued at more than \$12,000. Approximately 23 proposals were submitted to prospects during the year. Eight received favorable responses; seven decisions are still pending. Several of these proposals involve the establishment of a Center for Health Service Leadership, a concept that first was introduced during 1991-92 and

continues to be refined. Developing opportunities for private support of this initiative is a top priority for next year.

One of the basic components of alumni relations for the college is publishing the newsletter, *Recent Developments*. Two issues were produced during 1991-92. Additionally, the first Alumni of Merit recognition program was presented during Nurses' Week in May 1992.

The premier public relations activity for 1991-92 involved the program "Nursing's Agenda for Health Care Reform" presented by American Nurses' Association spokesperson Judith Huntington. This was one of the series of Third Thursday at the Thurmond programs sponsored by the Strom Thurmond Institute. More than 450 students, faculty and guests attended.

Teaching

Nursing Science

During the 1991-92 academic year there were 423 students enrolled in the Department of Nursing Science. New student enrollment in the B.S. program in 1991 was 132, which included 83 freshmen and 49 transfer students, a 36 percent increase over 1990-91. New student enrollment for summer and fall 1991 in the RN/BS/MS program was 12. Sixty of these students were minority (14 percent) and 19 were male (four percent). There were 89 students enrolled in the graduate program. New student enrollment in the graduate program in fall 1991 was 25 and in spring 1992, eight. A similar increase in undergraduate enrollment is projected for the 1992-93 academic year.

During the year program requirements of the Bachelor of Science degree in nursing were completed by 59 students. Program requirements for the Master of Science degree in nursing were completed by 10 students.

During 1991-92 the graduate program was supported by a Federal Traineeship Grant which provided \$15,061 for 13 full-time and two part-time graduate students.

The Department of Nursing Science also offered contract courses during summer 1992. Four sections of the Nursing Extern Practicum were offered at three area hospitals.

The college sponsored its 10th annual week-long summer nursing career camp for rising high school juniors and seniors. Baptist Medical Center (Easley) co-sponsored the camp which enrolled 36 students, 12 of whom were minority.

In August 1991 the Office of Nursing Enrollment became the Office of Enrollment and Advisement. The purpose of this change was to begin implementing an advisement center for freshmen and sophomore nursing students and eventually Health science students. This year more than 275 freshmen and sophomore students were advised by the director and a new student recruiter/adviser. Evaluation of this office revealed improved advisement and record-keeping processes.

The international relationship begun three years ago between the College of Nursing and St. Elizabeth's Hospital in the Netherlands has continued to grow, with expanded opportunities for visitors to each country. A faculty member and two students from the college spent one month in the Netherlands studying health care and health care policy. Three Dutch nursing students accompanied by a clinical tutor will spend one month studying health care in the United States during August 1992.

Further development of an international nursing/nursing education exchange with Australia was fostered by the associate dean's full participation in the 1991-92 Australian-American Nurses Exchange Program. Dr. Kline spent three weeks of June 1992 visiting with nurses in three states and six cities to learn about Australian nursing and nursing education. In addition to nine formal presentations on two nursing topics, she made visits to five hospitals, numerous nursing home facilities and several specialized dementia care units. Contacts were made to discuss nursing education and potential future exchanges with five different university Schools of

Nursing in four cities. Collaboration with the department head for Nursing Science has been initiated to foster further development of this exciting initiative.

The college served as a site for the third year of the SREB-sponsored Faculty Preparation for Teaching Gerontological Nursing project. The week-long course designed to improve nursing faculty's knowledge and abilities to prepare today's nursing students to care for the aging population included faculty participants from five states: South Carolina, North Carolina, Tennessee, Kentucky and Louisiana.

Health Science

From December 5, 1991 until May 1, 1992, 49 students transferred from other majors to Health Science. The students ranged between freshmen and seniors. Approximately half are interested in further professional studies including medicine, physical therapy and occupational therapy. The current majors include six males and 43 females. The first bachelor's degree in Health Science will be awarded to approximately 25 graduates in May 1994.

In addition to the major, the health science department continues to provide health service courses to non majors. During fall 1991 semester 442 students enrolled in nine health courses. During spring 1992 semester 586 students enrolled in 13 health courses and 224 students enrolled in six courses during the 1991 summer session. The number of students enrolled in health electives increased 45 percent in academic year 1991-92 when compared with the previous year.

Two innovation teaching proposals were submitted by departmental faculty. Dr. Rainey's proposal to develop a community health course for the senior year was funded.

The faculty and Office of Enrollment and Advisement have worked together to develop Guidelines for Student Advisement, a recruitment/marketing plan, brochures about the major and other related activities.

Research

The Department of Research provided technical and/or scientific assistance to 24 faculty and 26 students who conducted research under the auspices of the college. A strategic plan was developed, four issues of the newsletter were published and the seed grant program for faculty research development was administered.

Research grant activity during 1991-92 included one NIH grant in its second year at \$113,162, and nine intramural grants awarded to 10 faculty members, including one under the Clemson University/Greenville Hospital System Cooperative Agreement. Eight grants were submitted to extramural sponsors. Of these, three were not funded and five are in review.

Several faculty published in refereed journals and two faculty published textbooks, with a third text to be submitted soon. At least seven faculty made presentations of their research at national or regional research conferences.

International research projects were undertaken by three faculty examining health policy, adolescent risk behaviors and family problem solving. New initiatives were begun on cancer risk behaviors, AIDS and the elderly, infant mortality, therapeutic touch, expert systems, injuries in migrant children and nurses' job satisfaction.

The Department of Health Science has developed a planned research program for the department which will allow for team and individual growth in the area of research. The research program is "Health Risk Behaviors." The goal of the department was to develop and submit two grant proposals. Four proposals were submitted during this academic year, not including College of Nursing seed grants:

- Dr. Debra Broadwell Jackson, Clemson University Research Committee Grant, \$3,000 awarded for "Cancer Risk Behaviors of College-Aged Students."

- Ms. Carol Schwartz, Oncology Nursing Society, "Cancer Risk Behaviors of Black Youth"; not funded.
- Dr. Debra Jackson and Ms. Deborah Falta, National Cancer Institute, NIH, Small Grant Award, "Cancer Risk Behaviors of Black Children and Adolescents," submitted May 6, 1992.
- Dr. Cheryl Rainey, AREA grant, "Black American Maternal Concerns of Children's Health," submitted June 22, 1992.

Service

The College of Nursing provides service to the community through a wide variety of professional activities. Formal links to public and private service agencies and organizations exist throughout the state. The college maintains active representation through contractual and/or liaison agreements with the following:

- Area Health Education Consortium Nursing Council
- S.C. Public/Academic Mental Health Consortium
- S.C. Gerontology Center Policy Board

Individual faculty serve as active representatives to many community service agencies which include:

- S.C. Commission on Aging Statewide Advisory Committee on Alzheimer's Disease
- Board of Directors, Upstate Chapter of the Alzheimer's Association
- Committee on Nursing Education, S.C. Nurses' Association
- Hospice of Anderson

The Department of Professional Services comprises three programs that provide specific nursing, health and educational services to the public. The Nursing Center is a nurse-managed clinic that offers the public direct access to professional nursing services. These services include health assessment, screening and monitoring for chronic diseases, health information and support, counseling, and skilled nursing care. The Wellness Center is a voluntary, comprehensive health promotion effort designed to result in healthier lifestyles and personal well-being for University students and employees and to help to contain health-related costs. The program assists participants in the active process of becoming aware of and making informed choices about factors affecting their health and well-being. In addition to serving the University campus, the program serves S.C. businesses and industry by providing health screening and health promotion programs to companies who request these services.

During 1991-92 administrative and programmatic changes occurred within the department. In mid-August 1991, Dr. Pam Kline, associate dean, assumed additional responsibilities as head of the Department of Professional Services. An analysis of revenues and expenditures for Professional Services programs during the past several years reveals continued growth. Revenues for the Nursing Center increased six percent and revenues for the Wellness Center increased 20 percent from those received during 1990-91.

Increasing the public's access to health services continued to be a focus for the Nursing Center. Individual clients made a total of 3,872 visits for Nursing Center services. Of these, 304 were made to other sites including colleges, senior citizen centers and area industries. In September and October 1991, through an arrangement with the Office of Migrant Health, the mobile clinic was driven to Long Creek to implement an evening clinic for migrant workers. Utilizing the assistance of senior nursing students, health care services were provided to 34 migrant workers for a total of 51 visits. Plans are to expand this initiative in 1992. Other sites for mobile

clinic services included the town of Westminster, the town of Liberty, the Creekwood Housing Project in Central and Central Wesleyan College.

In addition to the mobile clinic, the Nursing Center provided a wide array of services for economically and culturally diverse populations. These include asbestos removal workers' physical exams, family planning services, the WIC program, EPSDT screenings, which experienced a 43 percent increase, flu shots which experienced a 59 percent increase, immunizations, child developmental assessments and physical exams, and CPR classes.

The Wellness Center continues to expand services both on and off campus. For the second year, letters were sent to all deans on campus early in the fall semester offering on-site screening services in their buildings. Subsequent screenings were held in various campus buildings including Martin, Lee, Sirrine and Lehotsky Halls. To inform people about the Wellness Center and to provide information about healthy lifestyles, 15 presentations were made by the director to a total of 1,050 people both on and off campus.

A Decathlon Club encourages campus participants to enroll in many wellness activities. Several hundred Decathlon Club cards were given to Slim Down participants and Wellness Challenge participants to encourage further use of the center. Wellness Fun Run/Walks were held monthly to encourage those on campus to develop their own exercise program. Pamphlets on the Wellness Center and Worksite Health promotion were given to various groups that visited the College of Nursing during the year. These same pamphlets were sent to various corporations and businesses and contacts made to establish a range of health promotion activities.

On April 2, 1992, the second annual Youth Fitness Day was held for all fourth graders in Pickens County. The Wellness Center, one of many organizations that helps sponsor this activity, was in charge of the mile run in which more than 1,200 young people took part.

The sixth annual Wellness Challenge encouraged regular aerobic activity in 175 students and employees in the spring semester. Many of the participants have continued during the past five to six years. Results continue to show that those who participate over time are reducing their health risk indicators.

Three Slim Down Challenges for the 1991-92 school year produced excellent results. Fifty-nine teams participated with a total weight loss of 958 pounds.

The first Wellness Week for faculty and staff was held April 13-17. Response to this new effort will be evaluated to assist in planning for a similar event in 1992-93.

A major accomplishment was the development of a student health/wellness group called Excel. The executive committee, made up of 25 students, serves as the governing body for the group. Excel was officially recognized and funded by student government in spring 1992.

In addition to the services provided through the Department of Professional Services, the faculty in the health science department continue to make service a high priority. This year the faculty have worked with News Services on campus to revamp the "Living Well" newspaper column of the College of Nursing. A question and answer format was developed and sample columns were written and edited. This service is coordinated by Dr. Debra Jackson.

Dr. Jackson has initiated a Health Today talk show on radio station WCCP (1560 AM) in Clemson. The station provides one hour each Friday morning to a discussion of up-to-date health issues. Ms. Carol Schwartz continues to develop monthly health education programs through the extension service. Her public service spots are videotaped and distributed to a wide audience.

Outstanding Faculty Accomplishments

- Dr. Pam Kline, associate dean and head, Department of Professional Services, was elected treasurer of Sigma Theta Tau International, the professional honor society for nursing. During her two-year term for the 1991-

93 biennium she also serves as a member of the executive board and the finance committee.

- Mary Reimer, director of the Media Resource Center, has been named editor of the Medical Library Association Nursing and Allied Health Resources Section newsletter for 1992-94.
- Dr. Debra Broadwell-Jackson, head, Department of Health Science, received certification as a Certified Health Education Specialist (CHES) from the National Commission for Health Education Credentialing, Inc.
- Dr. Robbie Hughes, Department of Nursing Science, was re-elected treasurer of the S.C. Deans and Directors, served as secretary of Appalachia District I of the S.C. Nurses' Association and was a member of the finance committee of the S.C. League of Nursing.
- Pat R. Maybee, visiting instructor-nursing, and Arlene B. Privette, assistant professor-nursing, were certified as clinical specialists in Medical-Surgical Nursing by the American Nurses Association.
- Nancy Longcrier, assistant professor-nursing, was elected to a two-year term to the executive committee of the National League for Nursing's Council for Nursing Informatics.
- Pat R. Maybee, visiting instructor-nursing, was honored as Central Ohio Technical College's alumnus of the year. In honor of her award, a scholarship will be given in her name to a current COTC nursing student.
- Katherine Nugent, associate professor-nursing, was elected president-elect of the Appalachia District Nurses' Association of the S.C. Nurses' Association.

COLLEGE OF SCIENCES

The College of Sciences research programs continue to grow in number and in scope. The college continues to cover about 30 percent of the teaching load for the University.

The first Graduate Teaching Assistant Workshop was held for a week prior to the start of the 1991 fall classes. Training sessions were held in teaching, planning and running laboratories, evaluations, problem solving and class management. The workshop was so successful that the graduate school has agreed to help fund this effort for fall 1992. Two of this college's graduate teaching assistants were recognized as Clemson's outstanding GTAs for 1992.

A \$4 million Alliance for Minority Progress Grant (five years) has been received with Clemson as the lead institution along with USC and others. The grant is to double the number of minority graduates in science and mathematics by developing a peer program similar to the one in engineering. The plan is to change the teaching of calculus (a gateway course) and develop analytical thinking. Dr. Doris Helms and Mr. Herman Green are project co-principal investigators.

Dr. J. David Gangemi has been hired as the director of biomedical research for the Greenville Hospital System/Clemson University Cooperative Research and Educational Agreement.

Larry Dwight Floyd, Jr., a Biological Sciences major, was awarded the prestigious Goldwater Scholarship which provides \$7,000 each year for two years. This is the second such award in the four years since the scholarship was established.

In June, Dean Bobby Wixson visited Hong Kong University of Science and Technology as part of the cooperative agreement between that university and Clemson to discuss the development of cooperative research with industries, cosponsored technical workshops, symposia and faculty/graduate student exchange program. Plans have been finalized for two workshops (symposia in biotechnology and environmental concerns) and two Clemson professors, Dr. James Jarvis (Math-

ematical Sciences) and Dr. Christine Jarvis presently are at Hong Kong University of Science and Technology on sabbatical leaves with additional faculty exchanges being planned.

Dean Wixson also represented Clemson at the Japan-USA deans meeting held in Japan in June. This meeting gave the opportunity for the deans to discuss similarities and differences between higher education in the two countries, and how students and faculty from each might work toward more effective exchange programs and cooperation.

The governor of Oita Prefecture (Kyushu Island) Japan invited Dean Wixson to visit the prefecture and look at ways of developing cooperative programs in biotechnology, agricultural education and other areas of Clemson's strengths. As a result of this visit, an invitation has been extended to a delegation from Oita Prefecture to visit Clemson in spring 1993 to develop an action plan for future collaboration that would be mutually beneficial.

Department of Biological Sciences

Whether it is to decide the "value" of an endangered species, approve the sale of food products that have been genetically manipulated, or make choices which affect our health, we are being called upon to make decisions which depend on biological literacy. We must insure that our graduates are prepared with the appropriate knowledge and skills to meet these intellectual challenges and play leadership roles in society. Our response to these demands has been extensive curricular revision at both the graduate and undergraduate level. At the undergraduate level we are continuing to build an integrated curriculum stressing the ability to integrate and thoughtfully analyze information from many sources, abilities that will be essential in dealing with the complex problems of the future.

At the graduate level we are striving to offer modern degree programs that will attract the very best students. This year we began to offer master's and doctorate degrees in genetics, and we are developing advanced degree programs in Plant Sciences. Such integrated and interdisciplinary degree programs are what prospective graduate students are looking for. Such interdisciplinary degree programs demand courses that cross traditional college and departmental boundaries. One such course taught this year was a collaboration between three departments in three colleges: poultry science, bioengineering and biological sciences. The course was directed at the biological basis for the stability of artificial implants. We also have begun teaching an advanced graduate course with our partners at the Greenwood Genetics Center. The center has a commitment to work with us to develop modern research and courses in the molecular and genetic basis for disease processes.

Two new additions to our faculty reflect the importance of plant biology in developing improved crops and in understanding how we can best preserve our environment. William Marcotte is a plant molecular biologist with extensive experience in genetic manipulation, and Timothy Spira is a plant population geneticist. These individuals will add significant strength to our already dynamic plant sciences group.

Our faculty continues to expand their research horizons; 80 percent of our research faculty are funded through extramural sources. Some highlights of this year have been a grant from the Shrine Hospital System to support work on surgical stress; a grant from the Department of Agriculture to support work on microorganisms that have the potential to degrade environmental pollutants; a grant, also from the Department of Agriculture, to study the plant enzymes involved in the conversion of sunlight into energy; and a grant from the TVA/Corps of Engineers to study the plants that affect inland waterways.

Molecular genetic research was the focus of the southeastern regional developmental biology meetings which were hosted by our department. Two hundred scientists attended and reported on their most recent results. Molecular genetics and

biotechnology also was the focus of the first statewide Biotechnology Conference. The meeting was held at Myrtle Beach in collaboration with faculty at the University of South Carolina and at the Medical University of South Carolina. The conference featured reports on current research being performed throughout the state. Researchers from the Colleges of Agricultural Sciences and Sciences at Clemson were featured speakers. The conference was so successful that plans have been made to have the conference every year.

Recognizing the importance of high power microscopy in modern research, we purchased and received two new electron microscopes this year. This was made possible through the cooperation of the Office of the Vice President for Research and Colleges of Agricultural Sciences and Sciences with the Greenville Hospital System, our partners in a multi-million dollar biomedical research initiative.

Biology Program

During the 1991-92 academic year, approximately 5,500 students were enrolled in courses in the Biology Program. Eleven lecture sections and 87 laboratory sections per week were taught each semester by faculty and graduate students from the Biology Program and departments of Microbiology and Biological Sciences.

Two faculty members conducted a workshop reunion at the annual meeting of The Association for Biology Laboratory Education in the teaching of investigative laboratories which was attended by 30 biologists from throughout the United States and Canada. Two others presented a workshop on graduate teaching assistant training at the same meeting. The Thirteenth Annual Clemson University Biology Merit Exam was conducted in April. Approximately 2,200 students and teachers attended. One faculty member has been selected by Wadsworth Publishers as author of a biology laser videodisc for general biology.

Several grants were awarded to faculty of the Biology Program during the 1991-92 academic year. These included a \$260,000 grant from the National Science Foundation for laboratory course development, continuation of a \$60,000 Undergraduate Faculty Enhancement Grant from the National Science Foundation, continuation of a \$200,000 Eisenhower Grant for the training of middle school science teachers, and a \$56,000 renewal of a grant from the U.S. Department of Education Fund for the Improvement of Post Secondary Education. Twelve grant proposals were submitted by the faculty; four were funded.

Scholarly activities by the faculty included five published manuscripts, four nationally published laboratory manuals, and authoring of six instructor's manuals. Fifteen papers were presented by faculty at national and regional meetings, including the annual meetings of the National Association of Biology Teachers, National Science Teachers Association, the American Association for the Advancement of Science and the Association for Biology Laboratory Education. One faculty member completed her term as chief reader for the Advanced Placement Program with the Educational Testing Service and taught 10 national biology advanced placement workshops. Faculty also continue to serve as reviewers for the National Science Foundation and various publishers of biology textbooks and laboratory manuals. Two faculty members were honored by having their project of Investigative Laboratories for General Biology nominated for a Dana Award of outstanding innovations in teaching.

Department of Chemistry

The Department of Chemistry has made substantial growth in teaching, research and service. All of this has occurred during an enormous transition time in terms of retirements and replacements.

Faculty and staff changes include:

- Dr. Ya-Ping Sun joined the faculty as an assistant professor of organic chemistry. Dr. Sun received his Ph.D. at Florida State University and completed postdoctoral work at the University of Texas at Austin.
- Dr. Jeffrey Appling joined the faculty as an assistant professor and director of the General Chemistry Program. Dr. Appling received his Ph.D. at Georgia Tech and had been on the faculty of the University of Kentucky for four years prior to coming to Clemson.
- Dr. Dwaine Eubanks joined the faculty as a professor and brings to Clemson the American Chemical Society's Examinations Institute. This institute prepares and distributes examinations for all areas of chemistry nationwide. Dr. Eubanks has been a faculty member at Oklahoma State University for many years.
- Ms. Lucy Pryde joined the faculty as an instructor and also as an employee of the ACS Exams Institute. Ms. Pryde was a faculty member of Southwestern College and currently is chair of the Chemical Education Division of the American Chemical Society.
- Mr. William Caldwell joined the department as glassblower. Mr. Caldwell is a master glassblower and has worked at USC and been in private business.
- Faculty and staff retirements include Dr. Joe Allen, Dr. Carl Bishop, Dr. James Fanning, Dr. Nick Marullo, Mr. Dave Mixon and Dr. Joe von Rosenberg.

The teaching programs have continued to grow at both the undergraduate and graduate levels. This year, more than 4,000 undergraduate students will be enrolled in chemistry courses. The quality of our lecture and laboratory courses also will improve with demonstrations added to the former and cooperative discovery-type laboratories (funded by NSF and the Department of Education) replacing the more traditional "cookbook" type labs.

In research, the department has had its best year in history. More than \$2 million of new funding was attracted to support research and graduate education and the prognosis of new funding for faculty hired in the last two years is great. Members of the department continue to publish more than 100 articles per year, and three of the faculty (DesMarteau, Jones and Marcus) have new patents in force or pending.

The summer undergraduate research participation program, funded by NSF and other sources, just completed its second successful year. Many of the good students from last year went off to graduate schools, with two coming to graduate school at Clemson.

A new major emphasis in public service in the near future will be teacher training and other activities directed toward precollege students. This expansion is the result of new hires in the department. As we continue to replace retiring faculty in our program, the critical issue over the next two to five years will be space. The success of our undergraduate and graduate program and research efforts will give our program notoriety, but also provide us with challenges for the future.

Department of Computer Science

The Department of Computer Science had another good year in 1991-92. The instructional programs were strengthened and research productivity increased.

The number of undergraduate majors remained at about 300 in the department's two B.S. programs. There were 54 B.S. graduates during the year, 21 in computer information systems and 33 in computer science. This is about the same number of B.S. graduates the department produced in each of the last two years, and it reflects

continued stability after a steady decline in the number of majors that occurred nationally between 1982 and 1987.

The number of graduate students increased dramatically from 102 in 1990-91 to 139 in 1991-92. There were 38 M.S. graduates during the year, a substantial increase from 19 in the previous year, but no Ph.D. degrees in computer science were awarded. Ph.D. graduates are expected to resume in 1992-93 and continue thereafter.

Employment prospects continue to be excellent for our graduates. The demand for graduates appeared to hold up well, although there was further decline in demand due to the downturn in the economy. Starting salaries were higher.

Externally funded research has declined slightly to about \$800,000 in annual expenditures. Good progress continues in diversifying and expanding the research funding base. The department also continues to be quite successful in attracting equipment donations to support research and instruction. Maintenance on our equipment continues to be a problem, however, because the operating budget allocation for the department is only half of the necessary expenditures. The remainder is generated by the faculty through research funding, but having to pay normal operating costs from research incentive funds inhibits the use of those funds to help increase the research productivity of the department. Equipment obtained through external research funding continues to be of great benefit to our undergraduate students as well as to our graduate students.

Space continues to be a major problem for the department. Permanent office and laboratory space for the department must be found to provide a reasonable "home" for the department. The temporary quarters in the Nursing Building have served the department well during its development, but there is not enough space in the building for both the department and the College of Nursing, and the building was not constructed with the needs of the department in mind. All available space is now filled, and the department is now in the position of having no space available in which to put donated equipment or externally funded research projects.

Our previously expressed fear that we might lose some faculty was realized when two of our junior faculty who were among our best teachers and most productive researchers left for positions elsewhere. It is important that improvements in faculty salaries and support increase if we are to become competitive with our peers.

A third problem area is in the recruiting of high quality graduate students. We are again unable to compete with the support levels that are offered by our peer institutions. An increase in assistantship stipends and the establishment of substantial fellowships are greatly needed.

Department of Earth Sciences

Earth Sciences faces the severe challenges of the new fiscal and academic year from a very strong position. The new graduate program emphasizing groundwater geology and designed to meet the pressing demand for qualified hydrogeologists, completed the first year as a resounding success. The SCUREF — supported summer field course held at the wellfield research laboratory at the SRS — supported by donations from Bob and Betsy Campbell — introduced young geologists from as far away as California and Ontario to the realities of groundwater geology. Dr. David Snipes, as principal investigator of a \$1.6 million SCUREF project, directed this field course, which has generated wide interest among groundwater specialists regionally and nationally. A significant outcome of this growing reputation is that graduate enrollments are up 60 percent over last May, and inquiries from future students are on the up-swing.

Researchers and graduate students led by Dr. Ron Falta, who joined the department in January, have been carrying out groundwater modeling utilizing the RISC 6000 computer system donated by IBM last year. The results of this effort have

been several papers on groundwater remediation, several research grants and several new graduate courses.

Dr. Richard Warner is the principal investigator on an NSF sponsored research project to study rocks from the lower earth crust. His investigations have involved undergraduate seniors in research and recently led to a student co-authored paper presented at the A.G.U. Montreal meeting last spring. Dr. Warner also serves as a co-principal investigator on the large SCUREF project.

The teaching of introductory geology students and upper class geology majors is an important mission of the department. The department is experiencing increasing enrollments in these courses, as well as a steady and sustained increase in geology majors. General interest in environmental problems, no doubt, plays an important role in drawing ever increasing numbers of undergraduates to geology courses. Consequently, the faculty teaching load is increasing.

The education of K-12 teachers and students is of great interest to the department. Professor John Wagner and Mrs. Betty Newton, museum curator, are very involved in these activities. Professor Wagner is completing his Ph.D. requirements in geologic education. His research involves comparing the effects of instructional strategies on more than 100 elementary education majors taking a special course in earth science.

Mrs. Newton has worked with mineral societies and individual collectors to build the geology museum into a major force for eliciting interest from the public, ranging between kindergartners and retirees. Donations to the museum almost topped \$119,000 during the past year. More than 5,000 people visited the museum last year, and the department expects more than 6,000 visitors to the museum in the new facilities in Brackett hall this year. At the current rate, the museum will outgrow the new facilities by 1995. Other educational activities include the judging of science fairs by several faculty and the leading of a field trip for the S.C. Earth Science Teachers Association by Professor Wagner and Dr. George Haselton.

Thanks to the support of the College of Sciences, the department now has an effective staff team to support the increasing activities of Earth Sciences. However, the need for a permanent department head to lead and expand the graduate program in groundwater and enhance the quality of the undergraduate program still remains. An additional graduate student stipend was added for this academic year; more graduate stipend support will be needed to insure that high quality graduate students will come to Clemson's groundwater program in increasing numbers. Finally, the department's operating budget must increase substantially to cover additional costs in travel, supplies, equipment maintenance and related needs.

Department of Mathematical Sciences

The Department of Mathematical Sciences continued its strong commitment to teaching, not only by offering nearly one-eighth of the total credit hour production of the University, including a very large graduate enrollment, but by continuing innovative new classroom techniques and formats. The department awarded 36 bachelor's degrees, 15 master's degrees and six Ph.D. degrees during the 12 month period. The faculty maintained and indeed increased its national and international stature for scholarly endeavors while at the same time serving professional organizations and Clemson in a myriad of ways.

Our innovative teaching of calculus, statistics and linear algebra using "smart" calculators (now in nearly half of all sections in the four semester calculus sequence) and micro computers continued to draw national attention. We hosted several summer activities related to technology in the classroom, bringing hundreds of university and high school faculty to the campus to learn about implementation, including a large percentage of the nation's high school advanced placement calculus leaders who were here as part of an NSF funded program to implement such technology in the high school advanced placement program. The next phase of our technology enhancement, a joint project with Georgia Tech, is to implement technology

on a large scale at two major engineering campuses. It was funded by NSF. In addition, the NSF funded a project which involved videotaping some of our faculty, as well as national mathematics leaders, illustrating such instruction. The tape will be mailed to every mathematics department in the United States.

Our graduate programs continue to be among the most successful in the United States. These master's and Ph.D programs draw students from all over the country, and they are among the very best the nation has to offer; among the class entering this fall — and recruited during the last year — are students from Syracuse University, Baylor University and Duke University, for example. The report on doctoral programs published by the Board on the Mathematical Sciences, the mathematical board for the National Research Council/National Academy of Sciences, mentioned in last year's department report, has now appeared. We were one of 10 Ph.D. programs believed to have been particularly successful which were visited to write the report. The report has placed us even more squarely in the national spotlight because the "word" is spreading, even though the report did not specifically name the visited schools. Our M.S. and Ph.D. students took academic positions at universities such as the University of Minnesota and N.C. State University as well as non academic positions at highly regarded technical companies such as Bell Communications Research and BDM Corporation.

The department's commitment to teaching and teachers was evidenced by our continued strong involvement in mathematics education. Through our various state and national grants and contracts, we have worked with mathematics teachers throughout the state, including the teaching of 18 off-campus courses explicitly for public school teachers. Our continuing projects included the \$1 million project for creating video tapes for classroom use (a subcontract from the Mathematical Association of America) and a SCUREF project for creating such tapes for elementary and secondary classes, the one-half million dollar project funded by the NSF for work with the Pickens County School District, and the aforementioned large scale project for high school advanced placement teachers. In addition, a faculty member was named S.C. Math Educator of the Year by the state's mathematics teachers.

We were able to bring our strong interests in the teaching of mathematics together with graduate programs and research. A year ago we were selected by a committee which is serving all three national mathematics organizations to be one of four national pilot projects to put a new emphasis on the teaching of mathematics as a regular part of the mathematics Ph.D. program, a project funded by the federal Department of Education. We offered a course for post-exams Ph.D. students, as described in last year's report, and it was wonderfully successful.

The research activity of this department continues to be first rate. Collectively, we published in excess of 50 research papers in professional journals, had about 50 accepted for publication, another 50 or so submitted for future publication, and gave numerous presentations at professional meetings. In addition to those grants mentioned above related to teaching issues, several other newly funded research projects had a particularly significant element. One of our young faculty members received an NSF basic research grant; these grants are the most competitive among all the funding in the mathematical sciences. Another young faculty member received two separate grants for work with NASA, a very rare accomplishment for a mathematician. We also had two separate research projects funded by Grumman Aircraft Systems involving graduate students and faculty. A project whereby two of our faculty members have totally revised the method the American Mathematical Society will use to match young job seekers with employers already is beginning to have a significant impact. Also, the Savannah River Project added a new grant to our continuing one to study ground water pollution. Among our other interesting continuing grants are a study modeling fire retardation research for the National Institute of Standards and Technology and our basic research grants with the NSA, NSF, ONR and AFOSR.

Our continuing "Distinguished Rotating Professor" series brought 10 of the world's leading computational mathematicians to campus this spring, including James Demmel of Cal-Berkeley, Stavros Zenios of the University of Pennsylvania, and Linda Petzold of the University of Minnesota. This series has a collection of outstanding researchers giving two or three lectures each as a doctoral level course for our graduate students and faculty. A member of our department continued to be managing editor of the 20,000 circulation *Journal of Quality Technology*, and a significant number of faculty members were involved in scholarly editing in each of our mathematical areas.

Members of our faculty served the University community. One of our members was president of the faculty senate, another was on the South Carolina EPSCOR committee; one of our faculty chaired the college's honors committee, and our faculty remain active in curricular and computing committees. We are a nationally active group as well. Members of our faculty serve on panels for the National Academy of Sciences, in high ranking positions with the College Board, and on executive committees for two of the three national mathematics organizations. Further-more, journal editors and journal board members are among our numbers.

One new distinguished senior faculty member joined us this year, and he already is contributing greatly. A junior faculty member completed her prestigious and successful postdoctoral appointment at the University of Waterloo.

All in all, we are proud of our yearly accomplishments, feel good about what we are doing and are pleased that our local, national and international reputations continue their upward movement.

Medical Technology Program

The Medical Technology Program completed another productive year of teaching, advising, administrative activity and club sponsorship. The program currently enrolls about 42 students. Three students currently are doing their senior clinical year at our hospital affiliates, completing baccalaureate degree requirements for graduation. Four students have graduated in the last calendar year. The senior clinical-year students continue to excel on the national certification exam. All have been successful in finding employment in the profession. With serious nationwide shortages in the profession, the number and range of professional opportunities are large.

Senior-year clinical courses continue to be offered by hospital program affiliates. Formal affiliation programs are with the schools of medical technology at Anderson (S.C.) Memorial Hospital and at McLeod Regional Medical Center in Florence. Informal affiliations exist with the medical technology programs at the Medical University of South Carolina in Charleston and the Baptist Medical Center in Columbia. The Anderson program continues to help teach the introductory medical technology course taken by new majors.

With the advent of government restrictions limiting healthcare reimbursements to hospitals and other providers, many hospital-based programs in health education need to develop additional sources of funding for fiscal stability. Through the Medical Technology Committee the University has instituted a plan whereby Clemson University provides a significant amount of support to the Anderson Hospital School of Medical Technology for each Clemson clinical student in attendance. This agreement has been renewed for a second two-year period.

The current program coordinator continued to promote medical technology by group and individual presentations to students and teachers from around the state and by participation in the annual spring meeting of the S.C. Society for Medical Technology. The student Medical Technology Club completed another successful year of activities which included presentations by speakers, service projects and attendance by several students at the annual spring meetings of the S.C. and N.C. Medical Technology Societies. The club once again has been funded by Student Government for the coming year.

Department of Microbiology

Approximately 90 students were enrolled in the B.S. degree program, and for the fall semester, 26 of these were named either to the dean's or president's list. A total of 25 baccalaureate degrees was awarded, and two students graduated with Senior Departmental Honors. Some graduates entered medical or dental schools, some continued their studies in doctoral programs, while others accepted positions with various industries or governmental agencies. Twenty-seven students were enrolled in the M.S. program and 17 in the Ph.D. Five M.S. and four Ph.D. degrees were awarded. M.S. graduates were either employed in technical positions or entered medical schools. Doctorates accepted positions at Temple University, Clemson University, Louisiana State University, or the Environmental Protection Agency.

Two graduate students enrolled in the M.S. program received awards for outstanding accomplishments. Ms. Ying-Ru Chen won first place in the graduate research paper competition at the annual meeting of the Institute of Food Technologists. This was a national award. Mr. Khatib Jafri received one of two University-wide awards as the "Outstanding Graduate Teaching Assistant" at Clemson University for 1992.

Faculty research resulted in: publication of 13 papers in international journals; publication of two book chapters; 12 presentations at meetings of professional societies; presentation of 10 invited seminars; and publication of a series of computerized auto-tutorial/test units for a microbiology text book.

Professional service of faculty included: senior editor of a journal, membership on editorial boards of professional journals; membership on review panels for NIH and USDA. One faculty member was appointed chair of the biotechnology section of the National Institute of Food Technology.

A variety of both basic and applied research projects were undertaken. Some were: the microbial breakdown of chemical pollutants in soil; the effect of a pesticide on microbial activities in ponds used for aquaculture; the nature of the bacterial population that develops on fish sold in supermarkets; the potential use of bacteriocins (natural antibiotics) to control pathogenic bacteria in fish used for human consumption; factors that affect the production of bacteriocins that kill food-borne pathogens that may occur in dairy and meat products; genetic and physiological studies of the enzymes that degrade cellulose and other polymers in natural organic wastes (relates to production of energy from renewable energy resources and to disposal of organic wastes); molecular genetics and the use of genetic engineering techniques to study bacteria that fix nitrogen for important agricultural crops, e.g. soybeans and clover; studies of environmental factors (e.g. smoking, tanning) that affect the human genome with potential for development of cancer; the ability of specific natural chemicals to stimulate the immune response and protect against certain specific autoimmune diseases; studies on regulation of plant and animal DNA engineered into bacterial cells.

There has been continued interaction with the two biotechnology companies, Molecular Rx and SBP Technologies, located at the Clemson University Center for Applied Technology. The companies have partially supported four graduate students with respect to stipends and operational costs. Furthermore, two employees of SBP Technologies have adjunct professional appointments in the department.

Department of Physics and Astronomy

On March 17, 1992, Professor Donald Clayton received the NASA Medal for Exceptional Scientific Achievement from NASA Administrator Richard Truly. The medal recognizes Dr. Clayton's many contributions in nuclear astrophysics, particularly those insights which provided a theoretical basis for NASA's building the Gamma Ray Observatory, one of the research satellites in NASA's great observatory series. Clemson's astrophysics group currently is analyzing data from the GRO

satellite. Dr. Clayton's current research ranges from studies of the nuclear reactions within stars to the composition of meteorites. Last year he was awarded the Leonard Medal from the Meteoritic Society.

John Meriwether joined the faculty as associate professor. He received his B.S. in physics from MIT and his Ph.D. in physics from the University of Maryland. His research interest is in atmospheric physics and optics. Much of his research involves probing the upper atmosphere with lasers. His research already has attracted two NSF grants within a few weeks of joining the faculty.

Professor Max Miller retired during the past year due to ill health. Max was on the faculty for 31 years. He received his B.S. and Ph.D. in physics from the University of North Carolina at Chapel Hill. It was Professor Miller who brought the laboratories into the computer age, starting with introducing computer interfaces for the experiments in Physics 223 and the junior lab. He also did much of the work in interfacing the superconductivity lab. His leadership in this area was of great value to the department.

Grant support from federal agencies for the research of departmental faculty exceeded \$1 million for the second year in a row.

One day each year the faculty and graduate students offer Physics Day at Clemson. This year 1,780 students came from 53 high schools around South Carolina. They were escorted by 65 teachers. Once again, Professor Tom Collins organized Physics Day. The presentations included Dick Manson's "The Physics of Music," Ray Turner's "The Physics of Toys," and Dieter Hartmann's lecture on modern astrophysics, "The Cos-B Show." A team of graduate students led by Matt Marone and Tim Marshall put together a series of demonstrations that has become a favorite of the students. The visiting students also could choose one of the planetarium shows presented by Jim Walsh and Neil Miller, two of our graduate students.

This year marked the first Godfrey Distinguished Lecturer in Astrophysics. This lecture series is supported by the Godfrey Trust donated to the department by William E. Godfrey who had served on the physics faculty and in the administration. He left the trust to support the study and teaching of astronomy. We were honored to have as our first Godfrey Lecturer, the noted British astronomer, Sir Fred Hoyle. Sir Fred gave a general interest lecture to the University community and a departmental colloquium during his extended visit with the astrophysics group.

This year marked a record number of invitations for faculty to present invited talks at four international conferences, 12 workshops and symposia and one NATO Advanced Study Institute. Topics covered a wide range, including nuclear reactions in stars, radiation hazards for astronauts in space, radar studies of phenomena in the atmosphere, ground level studies of molecular-surface interactions, and the fascinating physics of toys.

This year also saw two workshops in astrophysics: "Galactic Chemical and Dynamical Evolution," organized by Dieter Hartmann, and "Primordial Helium," organized by Brad Meyer. Both workshops were paid for entirely by external sources. They brought a lot of good physics and prominent scientists to the campus, and they were well attended by Clemson graduate students and faculty.

DIVISION OF AGRICULTURE AND NATURAL RESOURCES

The Division of Agriculture and Natural Resources is responsible for instructional, research and public service programs in the College of Agricultural Sciences and the College of Forest and Recreation Resources.

In addition to its programs for resident instruction the College of Agricultural Sciences administers statewide public service programs that serve businesses, industry and virtually every citizen of the state. These public service functions include

administration and coordination of the S.C. Agricultural Experiment Station, the Clemson Cooperative Extension Service, the Division of Regulatory and Public Service Programs and the Livestock-Poultry Health Department.

The scope of the College of Forest and Recreation Resources' programs also spans the entire state and touches the lives of all South Carolinians through teaching, research and Extension activities in forest management, wood utilization, recreation resources and services, and tourism management.

The division provides unbiased, research-based knowledge in such areas as agricultural production, family development and community development, helping and guiding South Carolinians in current and future decision-making.

Environmental concerns are weighed with productivity demands in the research and education programs of the division.

Research conducted at Clemson is forming a national model and demonstration project for environmentally sensitive golf course management. That work is a partnership bringing together Clemson, the U.S. Golf Association, the Professional Golfers' Association of America and Monsanto Agricultural Company. Another partnership with Sonoco Products Company in Hartsville resulted in the construction and equipping of the only packaging science laboratory of its kind in the Southeast, a model facility for research and teaching.

Clemson agricultural engineers are learning more about efficient solid waste management techniques and delivering their findings to municipal and county government leaders through a statewide videoconferencing network.

The General Assembly and Gov. Carroll Campbell have approved and signed legislation designating the Clemson University Botanical Garden as the State Botanical Garden of South Carolina. Under the expert care of Clemson horticulturists, the 256-acre facility will enhance South Carolinians' quality of life for generations to come.

More detailed reports of each unit within the Division of Agriculture and Natural Resources follow.

COLLEGE OF AGRICULTURAL SCIENCES

Academic Affairs

The academic mission of the college is to provide formal and informal educational opportunities for individuals at the undergraduate and graduate levels of study and to produce the expertise and leadership needed for further advancement and success of the agricultural industry. The college currently offers 11 undergraduate degree granting programs focusing on Agricultural and Applied Economics with an option in Community and Rural Development; Agricultural Education; Agricultural Mechanization and Business; Agronomy; Animal, Dairy and Poultry Sciences (Animal Industries); Aquaculture, Fisheries and Wildlife Biology; Entomology; Food Science with a minor in Nutrition; Horticulture with an option in Turfgrass Science; Packaging Science; and Plant Pathology. Graduate programs offered by the college include a focus on discipline and interdisciplinary orientations at the master's (M.S., M.Ag., M.Ag.Ed.) and doctoral (Ph.D.) levels. Graduate studies are available in Agriculture; Applied Economics; Agricultural Education; Agronomy; Animal and Food Industries; Animal Physiology; Aquaculture, Fisheries and Wildlife Biology; Entomology; Food Technology; Horticulture; Nutrition; Plant Pathology; and Plant Physiology. Last year graduate studies in Environmental Toxicology were added, followed more recently by graduate degrees in Genetics.

Enrollment in the college continues to increase. Since 1987 there has been a 112 percent increase, and the college expects another 25 percent increase in this year's enrollment to reach a student body in excess of 1,200. The undergraduate programs

in Animal Science; Horticulture; and Aquaculture, Fisheries and Wildlife Biology have maintained the greatest appeal to students along with an increasing interest in Packaging Science. The strongest demand for courses within and outside of the college is focusing on undergraduate and graduate statistics courses offered by the Department of Experimental Statistics.

Administratively, the majority of vacant positions remained unfilled due to the continued constraints on the budget. The college experienced a 4.5 percent reduction in funding which primarily eroded operating funds. Only one of the two department head vacancies were filled on a permanent basis by an internal candidate, i.e. Dr. Thomas Skelton was named head of the Department of Entomology. The college funded a 50 percent (0.5 FTE) position in Experimental Statistics to meet the increasing workload. No other positions were filled with E&G funds, even though Environmental Toxicology filled several positions on grant funds. No further improvements on classrooms and teaching laboratories were accomplished due to budget limitations.

New initiatives in the college included receiving five courses via satellite (AG*SAT) from other land-grant institutions; production and transmission of a course via satellite on Solid Waste Management; development of a distance degree program in Turfgrass Science involving Horry-Georgetown Technical College; establishment of a job placement office in the college; initiation of a mentorship program for high school science teachers; sponsoring a fall teaching colloquium for faculty and graduate students; facilitating establishment of a consortium with institutions in France; and establishing an organization for the Agriculture alumni with chapters both in and outside of South Carolina.

Teaching awards were received by several faculty in the college. Dr. Larry Bauer, professor in Agricultural and Applied Economics, received the Clemson University Alumni Master Teacher Award. Dr. Harold Allen, professor of Agricultural and Biological Engineering, received the 1992 NACTA Teaching Award. Dr. Elaine Richardson, associate professor of Animal, Dairy and Veterinary Sciences, received the Burtner Award for Excellence in Advising (University Award). Dr. Judy Caldwell, associate professor of Horticulture, received the Outstanding Undergraduate Educator Award by the American Society for Horticultural Science. Dr. Glenn Birrenkott, professor of Poultry Science, received the Ralston Purina Teaching Award by the Poultry Science Association.

Comments on Departments

Agricultural and Applied Economics. Two faculty now have been recognized as Alumni Master Teachers and one as an Alumni Professor, which underscores the quality of the faculty. The graduate program is recognized worldwide with inquiries from 31 countries. Last year the department received 79 applications and 450 information requests on its graduate program.

Agricultural and Biological Engineering. Faculty have been very active in sharing their expertise with high school science teachers. Such activities included grantsmanship, providing laboratory exercises and visits/instruction by faculty.

Agricultural Education. Faculty are exploring changes in their traditional mission. Significant efforts are being made in public service activities, such as "Ag in the Classroom" and aquaculture.

Agronomy. Faculty provided the leadership in establishing a new graduate program in Genetics. Also, efforts are being made to invite a member of the National Academy of Science to join their staff and provide expertise in colloidal chemistry for the benefit of the entire University.

Animal, Dairy and Veterinary Sciences. The largest number of undergraduates major in this discipline which includes pre-veterinary medicine. Two faculty in this department have received the University's Excellence in Advising Award. Employment opportunities are excellent in the animal industry.

Aquaculture, Fisheries and Wildlife. Majors in this discipline represent the second largest number of students by major in the college and shows strong growth in the future. The department has received an anonymous gift of \$5 million to strengthen undergraduate and graduate scholarships, a distinguished speaker program and research.

Entomology. With a renewed interest in graduate education, the faculty attracted one of the top merit scholars with a near perfect GRE (Graduate Record Exam) score. Faculty have enhanced their professional development opportunities and have shared their expertise worldwide with a special education experience in China. More than 3,000 S.C. students (K-12) have been introduced to the study of insects.

Environmental Toxicology. The graduate program which was formally approved in the 1992 spring semester has 50 students enrolled with the majority focusing on the Ph.D. This program emphasizes both basic and applied research on an international level.

Experimental Statistics. The demand for courses in curricula offered in the Colleges of Sciences, Nursing and Agricultural Sciences is at an all-time high. Courses are offered during all semesters including the summer and through tele-campus.

Food Science. Significant contributions from various companies (Sonoco, Cryovac, Self Foundation) have provided an opportunity to develop a state-of-the-art packaging science laboratory, to purchase equipment and to endow a chair in Packaging Science. Graduate students are being recognized for the quality of work and presentations made at regional and national meetings.

Horticulture. Faculty and graduate students continue to receive recognition for the quality of teaching and presentations on research. A new initiative in a distance degree program in Turfgrass Science should be a reality this academic year. Faculty are very involved in bringing technology to the classroom.

Plant Pathology and Physiology. Faculty have provided a strong graduate education with emphasis on the laboratory experience. Their technical expertise has been shared with undergraduate students and high school summer interns.

Poultry Science. Faculty are pursuing an innovative component of graduate education utilizing an industry based internship. A very aggressive approach in recruiting students is under way, since employment opportunities far exceed the number of graduates.

SOUTH CAROLINA AGRICULTURAL EXPERIMENT STATION SYSTEM

Facilities at Clemson and at four Clemson research and education centers across the state are part of the S.C. Agricultural Experiment Station System.

The system employs the expertise of scientists in 12 departments to conduct the state's only state-funded agricultural research program. System facilities provide in-

door and outdoor laboratories for scientists in agricultural and applied economics, agricultural education, agricultural and biological engineering, aquaculture, fisheries and wildlife, agronomy, animal, dairy and veterinary science, entomology, environmental toxicology, food science, horticulture, plant pathology and poultry science.

The Simpson Experiment Station near Pendleton serves as an outdoor laboratory for researchers and faculty at the Clemson campus, while branch research and education centers at the Edisto station in Blackville, Sandhill station near Columbia and Coastal stations near Charleston, act as branch research and education centers. Because of the geographic locations of the centers, researchers can conduct studies and carry out experiments relating to growers and crops in several areas of the state and the constraints and conditions of their different soils and climates.

The Experiment Station continues to adapt its research to the needs of the agriculture industry. Because of input from industry representatives and observers, research efforts are being focused in the following three areas: agricultural productivity, quality rural environment and agribusiness development.

In addition, the Experiment Station is conducting cooperative research with other states and countries to avoid duplication and to build on the foundation of information acquired through other research programs. As new challenges rise, the S.C. Agricultural Experiment Station will continue to try meet them by producing research findings that, along with those of other research facilities, will help create better standards of living through the wisest and best use of natural resources.

The following summary is a capsule review of the extensive research program at the Experiment Station. Many important studies may have been omitted, and those which follow are intended only to illustrate the scope of our total program.

Agricultural and Applied Economics

Research in the Department of Agriculture and Applied Economics focuses on four key areas: increasing profits from farm products in South Carolina; making S.C. agriculture more competitive relative to other U.S. regions and in international markets, predicting effects of U.S. government fiscal, monetary and farm policy programs on S.C. agriculture and rural areas; and making energy-efficient and environmentally safe use of natural resources (e.g., wetlands).

More than 80 percent of South Carolina's total land area is devoted to farming or forestry. South Carolina ranks second (behind California) in the production of freestone peaches, third (behind North Carolina and Kentucky) in tobacco production, and third (behind California and Florida) in fresh market tomatoes. Cotton acreage harvested has virtually doubled in the past three years, from 118,000 in 1989 to about 230,000 in 1992. Peach production is concentrated heavily in Spartanburg and Edgefield counties. But relative acreage has shifted between 1979 and 1991 in these two counties. In 1975, Spartanburg County had more than 897,000 peach trees and Edgefield had 588,000 trees. By 1990, Edgefield County had 996 thousand trees; Spartanburg County had declined to 610,000 trees.

Around 25 percent of South Carolina's land area is defined as wetlands. Aerial photography in the greater Charleston area indicates continued conversion of wetlands to urban uses, at least since 1970. In contrast, other wetland research indicates "political willingness" to increase acreage of publicly owned wetlands.

The state's population increased 11.7 percent from 1980 to 1990 — a gain of 364,883, making the 1990 total population 3,486,703. The urban population increased 60.2 percent, from 1,189,757 (1980) to 1,905,740 (1990). However, the rural non-farm population decreased 18.4 percent, from 1,878,468 (1980) to 1,532,398 (1990). Rural farm population fell 9.4 percent, from 53,595 to 48,565; the farm population now accounts for only 1.4 percent of the total.

In 20 of the state's 46 counties, more than 70 percent of the population is rural (non-farm or farm). These counties have: fewer than 50 persons per square mile; experienced population decline since 1980; more than one-third of all families headed by one parent; a per capita personal income of less than \$11,500 per year; infant

mortality greater than 14 deaths per 1,000 births; and a "dangerous-crime index" of greater than 515 (the average index for all U.S. rural counties is 415). It is difficult, both geographically and economically, to provide and maintain a viable infrastructure in these counties.

The impact of locating foreign-owned manufacturing (such as BMW) in South Carolina remains a lively topic. Recent research shows that foreign and domestic-owned manufacturers generally have similar impacts on local economies in terms of inputs purchased and occupational needs.

Recent research shows that the proposed North American Free Trade Agreement should help increase fruit and vegetable production in the Carolinas and Georgia. Peach production, as a result of provisions in the agreement, should increase by about one percent; cucumber production should increase by two percent. Export earnings, as a result, should increase, and retail prices of peaches and several vegetables (including cucumbers) should decline.

Agricultural and Biological Engineering

The mission of the Department of Agricultural and Biological Engineering is to provide the engineering input for the management of agricultural and biological systems and human and natural resources for effective and efficient production, processing, storage, distribution and utilization for the food and non-food needs of society. Seven of approximately 40 active research projects will be highlighted in this report.

Research is under way to increase fish production by manipulating fish populations to maintain higher densities early in the season and then splitting the fish for the half pound market or to other ponds. Preliminary results show production rates of 9,200 pounds per acre with average feeding rates of more than 60 pounds per acre per day. A recirculating raceway system is being designed with the fish confined to the raceway and the water recirculated through ponds for treatment. This system should increase production with improved water quality.

Two farrowing houses have been designed for use in South Carolina and Southeastern climates. These units follow the highly successful swine nurseries of which several hundred have been constructed during the post Hurricane Hugo era. Both designs are intended to maximize benefits of the relatively mild climate. One unit utilizes a mono-slope roof, natural ventilation and a passive solar collector and is expected to save heating energy while providing a comfortable summer environment. The second unit utilizes a gable roof structure and is designed to maximize natural ventilation for a cool summer environment. Prototypes have been constructed and currently are being tested.

A study using wood ash as an alkaline treatment material for sewage sludge is being extended to a pilot scale at the Mauldin Road Treatment Plant, Greenville. As part of this project, the ash/sludge mixture will be evaluated for agronomic uses.

Although size of sediment in runoff is of paramount importance in controlling transport and deposition, time-consuming and expensive methods now employed for particle size determination limit data availability and proper design of control measures. An alternative system utilizing laser optics, computer control and a swirl atomizer was constructed and is being evaluated to measure particle size distribution and concentration parameters of soil-water mixtures. Results from hundreds of tests show that the system differentially lifts particles into the sensing zone in a controlled manner, and a "signature" is obtained that can be related to particle properties.

A global analysis technique in frequency domain for qualitative inspection of processed and packaged food products has been developed. The feasibility of frequency domain analysis was demonstrated by systematically comparing the overall appearance of any object to the appearance of any other object using two dimensional Fourier Transform. Stress-cracked corn kernels and eggs with broken shells

were used as test objects to confirm the feasibility. Limitations and requirements were investigated for practical implementation of frequency domain techniques in inspection of food items.

To increase the efficiency of agricultural operations, there must be more accurate controls. There are several operations with a need to sense the ground surface through a standing crop. This would be necessary to direct a harvesting head or to inject material at a prescribed depth in the soil. A continuous wave radar system is being developed that will sense the ground surface through a standing crop. A continuous radar beam is transmitted from one antenna and aimed toward the ground surface. As the beam travels through the crop, some of the radar energy is reflected to the receiving antenna. The relative differences between the signal reflected from the crop and that reflected from the soil surface is used to identify the soil surface. The output of the radar system will be used as the input to a control system to enhance the performance of the machine.

Interseeding systems developed at Clemson have potential economic, soil conservation and energy conservation benefits. Growing two crops per year on the same land has economic and cultural advantages. With the interseeding system, the second crop (soybeans or cotton) can be planted in standing wheat. The wheat plants serve as a soil cover preventing erosion during the winter, and the stubble left after harvest protects topsoil through the production cycle of the second crop. An additional advantage is that the wheat drill rows serve as guide rows for intermediate production operations, thus permitting "controlled traffic" which reduces root-restricting soil compaction. Controlled traffic lanes also permit production operations to be performed in a more timely manner.

Agronomy and Soils

The Department of Agronomy and Soils includes faculty who conduct research in a broad range of plant, soil and environmental sciences.

Research in plant sciences includes cropping systems, agroecology, forage — livestock systems, plant breeding, basic genetics of crop plants, and weed ecology and management. Cultivar development programs are conducted in soybeans, wheat, oats and barley. Biotechnology is applied in plant science to understand the genetic control of key traits that may have commercial significance so that these traits may be incorporated into superior cultivars. Weed science focuses on herbicide resistance and better ways to manage troublesome weed populations. Cropping systems and agroecology emphasize more effective use of soils, crops and nutrients.

Research in soil sciences focuses on soil physical, chemical and biological processes, and on the character and origin of soils. Research is conducted on water movement, effects of soil morphology on water and chemical migration, mutualistic relationships between soil organisms and plant roots, and of the basic character of soils in South Carolina. Environmental sciences research relates to practical problems associated with the sound management of nonhazardous wastes, land application of industrial wastes, and effective management of the vadose zone to minimize groundwater impacts associated with landscape disturbances.

This past year, Clemson 100, a new barley variety, was released. Maxcy, a Group XX soybean, also was released. These two new small grain entries add to the growing list of public varieties available at a reasonable cost to producers. Public varieties and unbiased variety test information are among the products of the Experiment Station which can be immediately used to improve the profitability of farm operations.

Research on water movement through soil and the nutrients carried downward with the soil water is being considered in the development of a new classification system for soils which is based on this practical aspect of agriculture.

Cropping systems research continues to focus on more efficient use of nitrogen fertilizer and animal wastes, the use of the most effective herbicides, and selection of the most appropriate varieties that contribute to reduced production costs.

Animal, Dairy and Veterinary Sciences

The Department of Animal, Dairy and Veterinary Sciences carries out research, teaching and Extension work that focuses on five animal species, including beef and dairy cattle, swine, horses and sheep. Personnel in the department are educated in the areas of animal breeding, reproduction, nutrition, dairy products, meat science, dairy and livestock production and veterinary medicine.

Research focuses on seven primary discipline areas: breeding and genetics, reproductive physiology, veterinary medicine, production, animal nutrition, meat science and dairy products. The department is rapidly increasing its involvement in basic biotechnology research and desires to maintain a balance between basic and applied research. Team research both within and outside the department and college is utilized and publication in both peer-review journals and trade publications is used to communicate scientific results.

Research shows that the drug domperidone may have potential in treating the symptoms of fescue toxicity in animals. Past research at Clemson has shown that mares that feed on toxic fescue do not produce milk, have prolonged gestation periods, experience foaling difficulties, and may give birth to dead foals. Some mares die from these complications. When the drug was given orally to mares 30 days before foaling, the toxic symptoms were alleviated.

Several granting agencies supported a study on breed differences in ovarian function among Tennessee Walking, Arabian and Quarterhorse mares. This project will be carried out at the Horse Research Facility through November.

Another horse study is looking at the role of hormones in the stallion's ejaculate on mare ovulation. The first phase of this project contains high amounts of estrogen and prostaglandins.

A study was conducted to examine the efficacy of a hormone implant on timed ovulation in mares. Research showed that mares will ovulate within 24-36 hours after treatment, and thus need to be bred only once or twice to become pregnant. This treatment will be of great benefit to horse breeders around the world because it will save a considerable amount of labor and stallion use.

Another research project hopes to improve reproduction in food animals. Researchers discovered that a critical fat level for beef cattle to be reproductively efficient and that corpus luteum function (what maintains pregnancy) is compromised with underfeeding. Basic studies on corpus luteum function are now in progress to biologically define mechanisms and find solutions to these problems. Applied projects in bull fertility, synchronization of heat cycles, puberty in heifers and management systems to increase reproduction to an optimum level on a cow-herd basis are also in progress.

Another research effort centers on identifying the superior and inferior individual beef cattle for characteristics that particularly involve milk production and carcass traits and in validating the EPD concept. This involves initiatives at both the state and national level.

A study on seasonal effects of feeding a protected fat to lactating dairy cows was conducted. Though not statistically analyzed, apparently, the cows that received the protected fat in summer months produced more milk. No effects on milk composition have been noted.

Researchers are establishing inexpensive, workable swine farrowing and nursery buildings to take advantage of South Carolina's favorable environment. These houses will be compared with environmentally controlled buildings to assess productivity and healthiness of animals raised and to assess economic impact of each building system for increasing profitability to state swine production.

Other research focuses on lipid digestion and metabolism in ruminant animal species including feeding fat to cattle and sheep to study its effects on digestion and metabolism. Researchers are examining lipid derivatives that will increase tissue unsaturated fatty acids when fed to ruminants. Possible benefits of this research include enhanced nutritional value of meat and milk for human consumption, as well as basic information related to the biotechnology and regulation of tissue metabolism by lipids.

A system for collecting and culturing oviductal epithelial cells to form a monolayer, and for collecting the conditioned media from the cultures has been established. In vitro fertilized embryos developed to blastocyst when cultured with epithelial cells. Preliminary data indicate that in vitro fertilized embryos also will develop to blastocyst when cultured in only conditioned media. The next step of this research will be to identify the growth promoting factors present in the conditioned media.

Scientists are looking at the requirements of the preimplantation embryo and the role of growth factors in preimplantation development. Animal models used include embryos from the cow, the goat and the mouse. Specific objectives are to examine culture medium effects on in vitro blocked and non-blocked embryos, analyze culture medium from bovine and caprine oviductal monolayers and examine bovine and caprine embryos for the presence of growth factors and/or growth factor receptors.

Another project investigates the role of growth and differentiation of the preimplantation embryo of food producing animals. Scientists want to identify the genes associated with specific growth factors and proteins and want to develop a system of markers that can help select animals and strains of animals within a breed that possess the reproduction traits that result in greater fertility.

Aquaculture, Fisheries and Wildlife

The department's mission is to conduct research that will enhance management of fish and wildlife resources. Highlights of this research are as follows:

The development techniques to increase the productivity of catfish pond production systems highlighted aquaculture research during 1991-1992. One study showed that catfish can be grown at more than twice the normal density when harvested for a 0.5 pound market rather than the traditional 1.25-1.50 pound market. A second production study showed that pond productivity can be increased more than 19 percent by simultaneously growing fish in cages and open ponds and producing fish for both the 0.5 pound market and the 1.25-1.50 pound market.

A second line of research established salinity and environmental criteria for the safe handling and transportation of hybrid striped bass and red drum fingerlings. These criteria will help reduce losses of these expensive animals during the early phases of the culture cycle.

As a part of a larger project on the development of clam culture techniques for use on the S.C. coast, a system was developed to distinguish several species of larval *Mercenaria*, an economically important bivalve genus. This system will allow positive identification of culture species while in the larval stage.

Understanding relationships between riverine flow characteristics and fish species abundances are critical to habitat and species conservation. Relationships between relative densities of the mottled sculpin, turquoise darter, and margined madtom, and depth, velocity, substrate and cover were determined for spring and summer in the middle fork of Twelve-Mile Creek in Pickens County. Habitat suitability curves were created from histogram analyses of habitat intervals. Multiple regression analyses of mean cell values helped determine significant seasonal variables for each fish.

Using topographic maps, researchers have developed a statistically sound method for predicting quality habitat for the rare green salamander. Based on these procedures and ground truthing surveys, the Upstate contains more than 200 acres

of quality habitat dispersed throughout the more mountainous regions of Greenville, Pickens and Oconee counties. This is a much greater distribution of potential habitat than originally believed to exist based on earlier incomplete surveys.

A demonstration/research site established on University agricultural lands has been successful in illustrating water management practices that private landowners can use to benefit waterfowl and at the same time complement existing agricultural operations. Duck use has increased during the second year of operation to an estimated season use for 12 waterfowl species of more than 28,000 duck-days.

Entomology

Research in Entomology is primarily directed on those insects that adversely affect mankind, with the goal of utilizing environmentally acceptable strategies while reducing the cost of control. Faculty teams have been developed for each of five emphasis areas: crop insect management, medical and veterinary entomology, aquatic arthropod diversity, urban entomology and insect genetics.

Plants that are resistant to insect damage are valuable in pest management programs. Four tobacco breeding lines have been submitted for germplasm release by Clemson and USDA-ARS. Two of these are resistant to tobacco budworms, and two are resistant to tobacco aphids. Since all four lines have different mechanisms of insect resistance, this will increase the genetic material available for cultivar development in tobacco breeding programs.

The insecticide toxicology laboratory began to apply molecular genetics techniques to the study of insecticide resistance. The gene responsible for pyrethroid resistance in the *Heliothis* pest group has been identified, and an understanding of the mechanism of this particular type of resistance has been developed.

Physiology research has focused on developing an understanding of the physiological mechanisms underlying the migratory behavior of noctuids. An adipokinetic hormonal (AKH) factor was found in the corpora cardiaca from velvetbean caterpillar. This AKH factor was found to be responsible for maintaining the long duration flight behavior of adult velvetbean caterpillars.

Investigations on the biology of the azalea stem borer were initiated in three locations. This insect shows different developmental times depending on host (blueberry, azalea, rhododendron).

Mole cricket sound traps were monitored throughout 1991 to determine adult populations trends. This was the first time adult dispersal and mating flights were recorded all season in South Carolina. This was the beginning of base line data for early population levels responsible for damage to home lawns and turfgrass. Chemical and biological agents were evaluated for control.

Efforts to develop effective management strategies with biological insecticides were successful to the point that two *Bacillus thuringiensis* (Bt) products were recommended for looper control in soybeans. Toxin genes from Bt strain HD263 have been cloned in *E. coli*, and progress has been made in transferring these genes into plant cells.

Bt efficacy against blackflies has been researched in some form in the department since the early 1980s. One of two laboratory colonies of blackflies in the United States is maintained at Clemson, and the number of evaluations has increased each year since 1989. In addition to laboratory evaluations of 93 formulations in 1991, 40 field evaluations were conducted.

Releases of the predaceous fly, *Ophyra aenescens*, and subsequent spot larvicide applications have reduced house fly control costs in poultry houses more than 95 percent.

Entomologists at the Edisto Research and Education Center demonstrated that early season control of *Heliothis virescens* is largely unnecessary. This could save cotton growers about \$1 million annually, decrease the onset of pyrethroid resistance in the pest, and increase the impact of beneficial on pests that occur later.

Food Science

Interdisciplinary fundamental and applied research continues to be the major emphasis of the Department of Food Science. The department conducts research for the state of South Carolina in the disciplines of Food Science, Nutrition and Packaging. Integration of these areas of expertise provides a unique combination of talent which is unmatched in any other land-grant university.

The department's contribution to Experiment Station program areas includes the Food Processing and Packaging programs, the Food Safety through Biotechnology program, and the Self Foundation Multiuser Laboratory development program. Significant S.C., national and international research activity is conducted as a result of these programs.

A new protein separation process designed by the department was patented and could have a substantial impact on the food and biotechnology industries. Currently, the process is being tested in conjunction with private industry to establish its utility in point-source processing waste streams. The process uses metallic membranes to filter certain components from fluid streams. It holds great potential for a variety of food and drug products and processes. Growth regulating proteins and hormones produced through tissue or cell culture could be isolated without losing potency.

Participation in the SCAES Food Processing and Packaging program allows development of research in areas of economic importance to South Carolina. The program helped finance the construction of the new Sonoco Packaging Science Laboratory in Newman Hall which will be dedicated on Sept. 11, 1992. An initial Experiment Station grant of \$200,000 in program funds for packaging equipment has resulted in a cooperative effort between Clemson and private industry. The result was an endowment of \$500,000 from Sonoco Products Company of Hartsville for equipment purchases for the packaging laboratory. Additional commitments from private industry have established a \$250,000 endowment for lab operations. The resulting application of resources will soon result in a world-class food packaging program at Clemson.

Program research in processing and packaging has resulted in a cross-disciplinary research effort in new and innovative applications of food science, nutrition and packaging. Methods by which S.C. fruits, vegetables and floral products can be packaged to compete in the international marketplace continues. Ongoing research to develop techniques to form films from edible raw materials continues to address the need for environmentally sensitive packaging materials.

Additionally, food processing program funds have allowed the acquisition of processing equipment and funding to develop a significant food processing research effort. Investigations into a thermal process model for continuous-flow cooking food mix cooking allows development of equipment for efficient processing of S.C. food products. Investigations into new egg products will provide new markets for an important S.C. agricultural product. Development of new information on intact and formed meat products provides basic data upon which S.C. value-added meat product processors can draw. Again, research into the use of poultry meat products continues to emphasize the need for value-addition for a major S.C. commodity.

Participation in the Experiment Station's Food Safety through Biotechnology program has resulted in the identification of certain microorganisms which produce proteins (bacteriocins) that inhibit selected food spoilage organisms and show promise for inhibiting certain food pathogens. Isolation of such proteins allows development of new concepts for providing safe and nutritious food. Methods by which food processing can be controlled through use of bioactive proteins are being studied. Other methods by which bacteriocins can be utilized in food products, specifically in processed meats, are a major effort of the department and are yielding important results that can be used for value-added processing.

The Self Foundation Multiuser molecular biology laboratory was dedicated during the 1991-92 academic year. The Department of Food Science has been a leader in the development of the lab which will help scientists throughout the University in molecular biology and genetic engineering research.

Horticulture

The Department of Horticulture's mission is to discover new knowledge through research and to teach traditional and new knowledge to a broad range of students. Undergraduates, graduate students, members of the horticulture industry and the consuming public are benefactors of these research and educational efforts. The following items are research highlights from the past year.

A commercial planting was established as an advanced test prior to the release of a new rootstock variety that shows resistance to peach tree short life. Peach tree short life is the most devastating disease in peach tree production.

Construction of the new Musser Farm facilities near Clemson should be completed this August. Buildings under construction include a security residence, a main building (for farm office, laboratory and work space, and fruit processing, including a computerized grading line and cold storage), and an equipment shed/shop building. Other plans include fencing the orchards, building a pond and irrigation system, building a pesticide storage and handling building, and purchasing research and field equipment.

IPM funding was obtained to determine the feasibility of establishing nimblewill as a ground cover in peach orchards. Plots have been established in Edgefield, Spartanburg and at the Musser Farm to determine practical methods of establishing this grass in orchards from seed. Nimblewill is difficult to establish in most S.C. peach orchards, but it has potential as a non-chemical means for control of ring nematode. The ring nematode has been associated as a causal factor in death of peach trees to the short life problem.

Cultural practices are being evaluated to reduce chemical and labor inputs into peach orchards. Several training systems are being evaluated for efficient capture of light and fruit quality factors. Results over three years show that high intensity systems, such as Y-Trellis and Central Leader, have advantages in management requirements, fruit quality, and consistency of production over the traditional Open Center system.

Control of peach tree growth by non-chemical means is being evaluated. Results over three seasons show that spring root pruning and summer shoot pruning are effective non-chemical practices for controlling excessive vegetative growth and management problems associated with excessive shade.

Studies suggest that root pruning trees in the orchard may be a practical and non-chemical practice for reducing excessive shoot growth after crop reduction due to spring frosts. Root pruning also has reduced the amount of summer and winter shoot-pruning needed.

A series of studies is determining the effects of ring nematode on carbohydrate (both free sugars and storage forms) partitioning in young peach trees. Information from this work will help in understanding the mechanism responsible for differences in sensitivity to ring nematode among different peach rootstocks. Preliminary results indicate that ring nematode robs the tree carbohydrate energy reserves and makes the tree more susceptible to damage from cold weather and disease. Understanding this tolerance will help scientists develop new peach lines with improved tolerance to short life through molecular engineering and other means.

AAC and Chang Ji farm administrators from China met with Clemson University administration, Park Seed officials and Hollar Seed president regarding continued collaboration on research on generation of new watermelon and melon hybrids and subsequent increase in hybrid seed. The advantages of increasing the seed there are the same as for hybrid seed production — well-trained labor, reasonable costs, isolation in an environment with minimal cucurbit diseases.

With the recent discovery of trehalulose as a major sugar in sweetpotato whitefly honeydew when feeding on cotton plants, horticulturists have made significant progress into the amelioration of stickiness associated with sweetpotato whitefly honeydew deposits. This thrust has led to strengthened ties with basic researchers at the USDA and to the awarding of a new grant in Alternative Vegetable Pest Control Measures. All of these programs are helping establish Clemson as a leader in research dealing with this serious insect pest. This effort will greatly improve our knowledge of the basic biology of this pest and may lead to novel, biologically sound control techniques.

All 25 cultivars of St. Augustine grasses in the test planted in 1989 on a sod farm near the coast survived the winter of 1991-92 and came out of dormancy this spring in good shape. All 25 cultivars must be vegetatively planted. None are seed-ed cultivars.

All four cultivars of centipede grass planted at Clemson in early summer 1989 survived the winter of 1991-92. Three of these (Oklawn, Tenn Hardy and TC312) are reputed to be winter hardy. They are being compared with seeded common centipede. Oklawn and Tenn Hardy must be planted vegetatively. TC312 is a seeded cultivar from the USDA Experiment Station, Tifton, GA.

In the USDA-funded project, Alternative Cropping Systems, Clemson horticulturists are cooperating with colleagues at N.C. State University and the University of Georgia to study plant nutrient cycling and vegetable crop responses to reduced tillage. This involved planting sweetpotatoes and cucumbers into standing cover crops of crimson clover and wheat. This study included measuring nitrate movement in the soil as well as nutrient uptake by the growing crops. Another aspect of the project evaluates pea beans, long radishes and onions as potential crops for the Pee Dee area.

Last fall, the Department of Horticulture joined the Department of Biological Sciences and the Experiment Station in sponsoring a NATO Advanced Research Workshop on "Climate Change: The Biological Implications." The workshop brought together scientists from many disciplines who predict impacts of climate change on plants and animals.

A new research program has been initiated with funding from the USDA on Alternative Pest Control Methods for Vegetables. This is in conjunction with the departments of Plant Pathology and Entomology. The objectives are: to develop and evaluate microbial pest control agents for control of plant pathogens and insect pests of vegetables; to develop innovative cultural practices for vegetable production systems in South Carolina that reduce the amount of chemicals sprayed on plants; to assess the role of indigenous predators, parasites and pathogens in controlling pests; and to consider the presence of natural enemies in management decisions.

One-year-old azalea liners were potted in a pine bark medium amended following standard nursery practices. Data suggested that IBDU exhibited the least amount of N leached, whereas the Sierra tablets and Osmocote lost significant amounts of N in comparison. The IBDU treatment showed higher levels of leaf, stem and total plant dry weight when compared to the Sierra material. Analysis of the media of all three treatments showed no significant differences in N retention at the termination of the experiment.

Plant Pathology and Physiology

Faculty in the Department of Plant Pathology and Physiology are responsible for developing and testing the many approaches to plant disease control. Researchers look at plant resistance, cultural modifications, chemical applications and biological approaches to minimize losses from harmful pests. The range of research activities includes genetically altering plants so that they are more resistant to harmful organisms, developing host plant resistance, finding the best ways to plant crops to limit damage by microorganisms, and testing controls sold commercially to insure that they are environmentally safe and are effective as advertised.

A previous report highlighted recent progress made with cultural controls for plant parasitic nematodes common to most agricultural areas of South Carolina. This summary features activities toward developing host resistance to several pests.

A greenhouse bioassay has been adapted to measure resistance to soybean cyst nematodes in soybean breeding lines. The method conserves space, labor and time. A new multiple-nematode resistant soybean variety evolved through this system. An important point is that comparisons over several years of testing soybean cyst nematode reproduction on lines both in the field and in the greenhouse revealed similar reactions, indicating the greenhouse assay is a useful resistance screen with field applicability.

A service with immediate application to growers is cultivar screens in the field to verify reported resistant reactions. Twenty-five entries of maturity groups V and VI and 20 of groups VII and VIII soybean cultivars were evaluated in separated tests for race three of soybean cyst nematodes, lance nematodes and the peanut root-knot nematode. There were significant differences among the cultivars. The results were published for all producers to use.

Six cotton cultivars were evaluated under field conditions for their reaction to lance, reniform and southern root-knot nematodes. As expected, there was no difference in their response to lance and root-knot nematodes. The PD 3 variety had the lowest yields in the presence of reniform nematodes.

A series of experiments to screen *Prunus* germplasm for resistance to a ring nematode was completed. None were found to be resistant. However, several breeding lines were found to be resistant to the peach tree short life disease and are being tested as probable rootstocks for peaches. A concurrent program is developing a method to detect viruses in very small amounts in fruit trees so that certified material can be released as soon as field tests prove that rootstocks and other breeding material are suitable over a wide variety of growing conditions. This work involves developing clones to RNAs of the viruses so that probes can be made from new fruit tree tissue for damaging plant viruses. These tests are so precise that lightly infected tissue from peaches grown in test tubes can be checked and certified.

Experimental tobacco varieties were grown under controlled disease pressure in the field to evaluate levels of resistance to the organism that are the causal agents for black shank and Granville wilt.

On a less positive note, over the past year more fields containing root-knot nematodes (for which there is no resistance in common crops such as tobacco, cotton and peanuts) have been found. Fruit rotting fungi resistant to fungicides were isolated from discarded fruit. However, with these few exceptions, there are practical controls for the diseases of the major crops grown in South Carolina. Controls sometimes take multiple applications of both the methods and pesticides and the timing must be precise. Plant disease controls are finely tuned operations that change annually.

Poultry Science

The research effort in the Department of Poultry Science is to advance the basic knowledge of poultry. Fundamental research is conducted in environmental science, immunophysiology, genetics, nutrition, pathology, physiology and reproductive endocrinology. The department's long-term research emphasizes molecular approaches. The specific needs of the poultry industry are included in planning the department's research.

To stimulate cooperative research, the department initiated an umbrella program in 1987, "Immunoenhancement of the Embryo." The concept of the program was, in part, responsible for the initiation of numerous new research efforts. Several significant observations have been made. Strategies, supported in part by a USDA grant, to understand the mechanisms controlling the development of cells important in the immune response have been identified. A novel dendritic cell may play a key role in the differentiation of cells capable of producing antibody.

The Immunology program continues to emphasize tissue culture and the collection of monoclonal antibodies which are biological probes allowing the research to identify specific cellular types. These techniques allow scientists to use a reduced number of chickens to study immunological mechanisms. A grant from Embrex, a biotechnology company in Research Triangle, N.C., is helping researchers to raise monoclonal antibodies to important proteins which regulate immunity and will protect against disease.

A unique cellular mechanism that may have far-reaching implications for all animals was discovered while studying turkey spermiogenesis. The novel cellular process involves mitochondria and may contribute to the understanding of numerous disorders in humans as well as chickens.

Using biotechnology techniques, scientists have cloned molecules from *Pasteurella multocida*. These plasmid clones may be important in future vaccination programs of chickens and turkeys.

Equipment and research support of more than \$20,000 has been supplied by Carolina By-Products to the nutrition program. These studies will help pioneer lipid metabolism and applied research for chickens and other monogastric animals such as humans.

Another project looks at the methods of stunning turkeys to eliminate pain and improve the removal of fluids from the bird. The research, which emphasizes the humane treatment of animals, was supported by a grant from Oscar Mayer Food Cooperation.

A fetal alcohol model for elementary school students was developed by the department. This model utilizes the chicken embryo to demonstrate the toxicity and danger of alcohol to humans.

For two years, the department has collaborated with Extension personnel in other departments to develop an educational program to compost dead birds. By employing and improving existing compost techniques, the poultry producers of South Carolina could conserve and improve the state's environment.

The Institute of Wildlife and Environmental Toxicology (TIWET)

The Institute of Wildlife and Environmental Toxicology has a clearly defined mission statement: "Dedicated to excellence in research, education and public service programs in Environmental Toxicology: seeking the best scientific data possible as a foundation for resolving ecological conflicts between aquatic and terrestrial wildlife resources and toxic substances released into the environment." TIWET now has expanded its program to include the following research sections: Aquatic Toxicology, Ecological Modeling, Biochemical and Behavioral Toxicology, Ecotoxicology, Environmental Chemistry, Quality Assurance and Management, and Research Support.

Ecotoxicological studies involving chemicals used in agricultural production in the Midwest are continuing in both aquatic and terrestrial studies. Most of our Midwestern research operations are conducted through the Edith Angel Environmental Research Center which was dedicated in May 1992. These large-scale, multi-year studies have been initiated to investigate the effects of pesticide runoff into farm ponds in the Midwest; the use of agricultural insecticides on wildlife, particularly avian species; and non-point source pollution runoff in watersheds.

Geographic Information System equipment and software have been added which will be used to determine the potential hazard of agrichemicals used on crops in a variety of landscape types. Supported by TIWET researchers and the faculty of Agricultural Engineering and Environmental Systems Engineering, this research specifically focuses on the fate in soil and the runoff of insecticides commonly used on corn crops. Finally, the field research is being supported by monitoring field sites to look at the range of water quality parameters that affect fish health.

Research continues on the golf course ecosystem research project on the Ocean Course at Kiawah Island. TIWET is addressing environmentally sensitive techniques for golf course management with support from the Professional Golfer's Association, U.S. Golf Association and Monsanto.

Another project attracting major public interest is the work in Costa Rica in cooperation with the E.A.R.T.H. project and CORBANA. This cooperative project is addressing the effects of runoff of pesticide chemicals on fish and wildlife species associated with banana plantations in Costa Rica. This project also attracted CNN news coverage with a special documentary on environmental research in the banana plantations and was scheduled to air in August 1992.

The Department of Environmental Toxicology, within Clemson's College of Agricultural Sciences, has grown tremendously during its first year. This academic department offers M.S. and Ph.D. programs in Environmental Toxicology. The department and TIWET share a common mission and work closely together and with many other programs on campus to produce a graduate program in environmental toxicology. Faculty members have been added bringing the total number this fall to 13. Currently, more than 40 students are enrolled in this graduate program.

Coastal Research and Education Center

The primary responsibility of the Coastal Research and Education Center is to develop efficient and economical systems for commercial vegetable production in South Carolina. A primary goal is to become a center of excellence for vegetable research.

In cooperation with a local grower, new integrated control measures were tested against the spinach disease, white rust. The most effective treatment was a combination of a resistant cultivar, a soil fumigant and a systemic fungicide. These results will help ensure profitable spinach production in coastal South Carolina.

A virus that attacks larvae of the imported cabbageworm, an important pest of several Brassica crops, was isolated from the field, cultured in the lab, and applied to populations of caterpillars in the field. Although all larvae contracted the virus and died, control of the pest will require that early stage larvae are treated.

A new bioengineered strain of the bacterium, *Bacillus thuringiensis* (Bt), exhibits longer field persistence than conventional strains against caterpillar pests of cole crops and new conjugal strains of Bt were highly effective against these pests.

Collard plants with glossy leaves were more resistant to insects than were standard commercial varieties. The use of fast, efficient field scouting procedures has allowed more appropriate timing for applications of biological control materials.

Conservation of indigenous predators and parasites through the use of biological control, along with resistant plants and efficient field monitoring techniques, forms the basis for a model integrated pest management program on cruciferous crops that is currently being tested.

After five years of research on forcing crops to grow out of their normal season, off-season asparagus production is very promising from July to October in the coastal region.

Seedless watermelons can be nutrient conditioned during the transplant production phase to produce earlier yields months after field planting. Bell pepper transplants will establish sooner after field planting and yield sooner if conditioned with nutrients during greenhouse seedling production.

Edisto Research and Education Center

The Edisto Research and Education Center's mission is to conduct research, extension and teaching programs that focus on agricultural problems unique to the Coastal Plains region. Emphasis is placed on problems that demand multi-disciplinary team approaches for solutions. The goal of the center is to develop, evaluate

and transfer new and improved technology and to incorporate this information along with traditional practices into production systems that enhance agricultural production and profit while protecting the environment and natural resources.

Extensive studies conducted on kenaf show that this crop can be grown in South Carolina if a market develops. Research also shows that insect pests are not a major problem, but nematodes do threaten the crop.

An experimental lab forage conditioning system was designed and constructed. It will determine the effects of temperature, combined with different levels of roll pressure and processing rate, on the drying rate of forages.

Tests were conducted to: determine proper production strategies for interseeding cotton into standing wheat; compare the yields of interseeded cotton with those of conventional, mono-cropped cotton, cotton planted after wheat harvest and no till cotton planted behind grain used only as a cover crop; to determine the effects of cropping systems on cotton root and above ground growth and development, as well as node length and boll location; and to evaluate fiber quality of cotton harvested with a spindle picker from interseeded plots.

Studies were conducted to determine the energy and draft requirements of a new plow called the "Switch Plow," and a Tye paratill at three operating depths and three ground speeds. These tests will be repeated on Piedmont soils.

A study was completed on the effects of doublecrop tillage systems on Hessian fly, the key pest in Southeastern wheat production. The results of the study will allow growers to maximize the benefits of cultural control.

Another study looked at the feeding behavior of three primary economic pests in peanuts. The results are being used to determine when pesticide applications are profitable.

Six demonstration sites in Clarendon, Newberry, Barnwell and Anderson counties were established. This project demonstrates new conservation tillage/interseeding systems and controlled traffic technology which reduces fuel consumption and soil erosion while increasing net returns. The results of this project are being distributed widely.

Pee Dee Research and Education Center

The Pee Dee Research and Education Center was established in 1911 to meet the needs of growers producing the major crops being grown in the Pee Dee region which amount to more than 50 percent of the agricultural income within the state.

A new study on the use of drip irrigation and plastic mulch in tobacco production began last spring. Researchers will investigate the irrigation water usage by the crop, injection of nitrogen into the irrigation water, nitrogen uptake by the plant and the response of three varieties with different rooting vigor.

Preliminary experiments look at the nitrogen and carbohydrate partitioning of field grown tobacco. The initial study will be designed to provide sample material to begin establishing a link between data from plants grown in controlled environments and plants grown in the field. Drip irrigation will be used in later studies to provide some degree of control of nitrogen and water available to the plants.

Another study aims to solve water quality problems in the float production system. Many water supplies in the Pee Dee region contain high concentrations of sodium and bicarbonate which are detrimental to plant growth. Neutralizing the bicarbonate with sulfuric acid produced a marked improvement in plant growth.

Physiological studies show that soil moisture is a major limiting factor of winter wheat grain yield on the sandy Coastal Plain. Studies show that profitable seed and straw yields of flax can be produced in South Carolina.

Fosthiazate, a nematicide manufactured by ISK Biotech, was tested for rootknot nematode control on flue-cured tobacco. The new nematicide provides excellent control of several pest species and may improve nematode control in South Carolina.

Tobacco varieties were evaluated for granville wilt and blackshank disease resistance. Data on experimental and released varieties provide promise of improved disease control by host plant resistance.

In cooperation with Powell Manufacturing Company of Bennettsville, researchers field tested precision planters for experimental multi-pick cucumber harvester evaluation.

Sandhill Research and Education Center

The mission of the Sandhill Research and Education Center is to conduct research and extension programs in fruits, vegetables, ornamental crops and swine.

A new peach rootstock line (B594520-9) continues to outlive the recommended standard Lovell rootstock on peach tree short life test sites at the Sandhill. Individual tree selections from this line have been propagated and will be planted this winter on farms in South Carolina and Georgia. One of these selections will be chosen to be the parent tree for a new peach rootstock cultivar based on its seedling nursery characteristics, its growth, survival, productivity and rootknot nematode resistance in field tests. This new rootstock eventually will be released by Clemson University and the USDA Fruit and Nut Tree Research Lab at Byron, Georgia.

A peach genotype (P.I. 101667), when used as an interstem, continues to delay bloom of Junegold and Loring peach cultivars by seven to 15 days. In addition, fruit maturity date has been pushed back six to seven days. These interstems also have reduced the trunk cross-sectional areas by 36-38 percent after four growing seasons. However, fruit yields and fruit quality have not been reduced. Additional research is being conducted on nine other peach varieties propagated to this interstem.

Three provinces in China were visited in early September to collect chestnut, walnut and peach germplasm. The trip was very productive and numerous contacts were made with tree fruit and nut scientists at a number of universities and research institutes. Some exchange of chestnut, walnut and peach germplasm already has occurred. Future exchanges of plant germplasm, graduate students and scientists are also expected to result from this trip.

Nucleic acid clones specific for *Prunus* necrotic ringspot virus and prune dwarf virus have been developed. The clones, used in conjunction with PCR technology, provide the most sensitive biochemical means of detecting these viruses at present available. This detection system is being used both in research and as a means of testing mother trees in the Peach Certification Orchard for the presence of these two viruses. Sensitive, reliable detection of these viruses allows elimination of newly infected trees and helps maintain the virus-free status of the trees in the orchard.

Studies were conducted to determine the influence of nitrogen and potassium nutrition on the yield, biomass partitioning and pungency of jalapeno peppers. Increasing the nitrogen and potassium concentration in the nutrient solution increased the yield of jalapeno peppers grown in sand culture. Data from the chemical analysis of pepper samples for capsaicin concentration (pungency compound) is being analyzed.

Cultivar trials on jalapeno peppers and a study to determine the feasibility of growing habanero peppers were conducted at the research station and on a grower's farm in Lexington County. The jalapeno pepper cultivar studies were conducted to determine the best jalapeno pepper cultivar for use in South Carolina. The newer hybrids such as 'Mitla' and 'Jalapa' produced a higher yield than the standard open pollinated cultivar 'M'. The habanero peppers produced a very high yield of 40,000 lbs/ac of peppers.

Studies were conducted to determine the feasibility of utilizing controlled release nitrogen and potassium fertilizer in the production of rape greens and green bunching onions on grower's farms in Lexington County. Controlled release fertilizer produced crops of green bunching onions and rape greens similar to those produced with higher rates of soluble nitrogen and potassium sources.

A cooperative study with USDA Soil Conservation Service on low maintenance herbaceous perennials was initiated last spring. Twenty-five species are being evaluated for use in landscapes and along rights-of-ways.

The statewide wildflower program coordinated with the S.C. Department of Highways and Public Transportation was expanded to 16 new locations. Many of the 1991 plantings were in full bloom this spring along with the new plantings. Approximately 2,000 acres of crimson clover were planted along major highways this past year. The clover will eliminate one mowing of the highway rights-of-way with a cost savings of \$20-\$30 per acre. This program will continue for several years until most of the suitable acreage is planted.

Research on slow release fertilizers and field-grown shade trees shows that fertilizers need to be placed on only one side of the tree row. The use of slow release fertilizers in field conditions requires that they be placed in the ground rather than on top to prevent washing by rainfall.

The Swine Evaluation Center, located at the Sandhill facility, conducted genetic evaluations on three groups of boars. One test group established a new daily gain record average of 2.36 pounds per day, while another group established a new low back fat average of .63 inches. Genetic improvement continues and provides important data on herd sire performance for the state's commercial hog producers.

Active Research Projects 1991-92

Agricultural and Applied Economics

Analysis of structural and organizational changes in rural counties in the South.

Changing patterns of food demand and consumption behavior.

Potential for community economic development and its impact on rural residents.

Economic and technical forces shaping the Southern dairy industry.

Competition and change in the fruit and vegetable production and marketing system.

Agricultural adjustment in the Southeast through alternative cropping systems.

Changing structure of local labor markets in non-metropolitan areas.

Quantifying long-run age risks and evaluating farmer responses to risk.

International trade research on commodities important to the Southern region.

Economics of wetland preservation.

Economics of disadvantaged regions.

Transformation of agriculture: resources, technologies and policies.

Econometrics analysis of employment in agribusiness industries.

Economics of wildlife resources.

Forward pricing mechanisms to manage agricultural risk in South Carolina.

Economic value of ornamental horticulture.

Impacts of agricultural development and policies in selected countries on South Carolina and the Southeastern United States.

Agricultural Education

Diffusion of technology to traditional and non-traditional agricultural education clientele.

Agricultural and Biological Engineering

Automatic control of field machine functions for increased efficiency and energy conservation.

Hydrologic/water quality modeling of sediment and chemical movement.

Control, prediction, economics and environmental effects of soil erosion.

Dynamic modeling of water quality in aquaculture.

Integrated systems and controls for processing and storing agricultural commodities.

Systems for providing and controlling interior environments for poultry and livestock.

Development and verification of a thermal process model for continuous-flow food mix cooking.

Barrier and mechanical properties of edible, degradable films produced from soy and cereal protein.

Meteorological research and agricultural management modeling for Southern agriculture.

Engineering systems for plant tissue culture.

Ground surface sensing through plant foliage.

Management of animal waste in support of sustainable agriculture and quality water resources.

Improved harvesting, sorting and production practices for channel catfish and crawfish.

Mining BMP evaluation.

Nutrient and pesticide management demonstration.

Orchard BMP demonstration.

Agricultural watershed demonstration.

Optical measurement and inspection of biological systems.

Physical property modification of edible, degradable films.

Defining thermoneutrality of brooding age broiler chickens via a thermal environment index.

Impact of agricultural systems on surface and ground water quality. Improved pesticide application technology for peach orchards.

Agronomy and Soils

Chemistry of atmospheric deposition: effects on agriculture, forestry, surface waters and materials.

Mineralogy of selected soils in the Southern region.

Weed control and herbicide resistant weeds in corn, cotton and soybean.

Effect of soil test values and fertilizer amendments on the nutrient content and yield.

Enhancing beneficial microorganisms in the rhizosphere.

Variability of soil properties and its effect on water quality and soil management.

Cellular and molecular genetics for improvement of maize and fescue.

Chemical parameters affecting aluminum biogeochemistry in Southeastern U.S. soils.

Grain yields and field performance evaluation of barley, oat, rye, triticale and wheat.

Cultivar performance evaluation of corn, cotton, grain sorghum, peanuts and soybeans.

Breeding tall fescue in South Carolina

Mixed species pasture establishment and persistence.

Genetic and molecular markers for chromosome engineering in soybean.

Soybean Breeding.

Ecological relationships in the productivity and persistence of high quality forages.

Plant development responses to relay intercropping.

Animal, Dairy and Veterinary Sciences

Nutrition and management of swine for increased reproductive efficiency.

Bovine somatotropin (BST) in lactating dairy cows and concentration in dairy foods.

Genetic potential of beef cattle for forage utilization. Genotypic evaluation of Zebu and British-Continental cattle.

Development of profitable beef forage production systems for the Southern region.

Genetics of body composition in beef cattle.

Rapid determination of milk shelf life using antibodies to spoilage bacteria.

Selection for improved growth of muscle in swine and the effects on hot processed meat products.

Effect of dietary toxins on cellular immunity in cattle, chickens and horses.

Growth of muscle and deposition of fat in beef as related to genetics and forages.

Influence of seminal estrogens on uterine and ovarian functions in the mare.

Expression and function of oviductal growth factors during early embryogenesis in the pig.

Feasibility of reduction of fat percentage in fresh pork sausage.

Dairy herd management strategies for improved decision making and profitability.

Evaluation of beef cattle germ plasm resources involving additive and non-additive genetic effects.

Improving reproductive efficiency of cattle.

Modifying unsaturated fatty acids in ruminant tissues.

Growth factor involvement in bovine and caprine embryo culture.

Mycotoxin effects on the maturation and function of chicken thymocytes and peripheral T-cells.

Aquaculture, Fisheries and Wildlife

Environmental requirements and transport related stress in hybrid striped bass and red drum.

Status of the green salamander in South Carolina.

Black bear demography, habitat use and home range in South Carolina.

Abundance and diversity of fishes in relation to stream habitat.

Effects of formulated ration on crawfish production and water quality in ponds.

Biological Sciences

RFLP and molecular analysis of root-knot nematodes, nematode infected plants and peaches.

Entomology

Management and biology of arthropod pests of livestock.

Integrated management of cockroaches in structural and industrial environments.

Control of selected insects and mites attacking ornamental trees and shrubs.

Improved systems of control for pecan arthropod pests.

Black fly damage thresholds, biology and control.

Behavioral and control studies of red imported fire ant.

South Carolina participation in NAPIAP.

Cloning and analysis of genes for insecticide resistance.

Bionomics and interactions of corn earworm parasitoids with area-wide management control.

Biology and management of peach arthropods.

Identification and distribution of insects of potential importance in South Carolina.

Development of entomopathogens as control agents for insect pests.

Development and reproductive behavior of selected Tachinidae parasitizing *Helicoverpa* (+ *Heliothis*) zea.

Biology, ecology and management stresses for azalea stem borer and dogwood twig borer.

Cultural management of alfalfa weevil.

Neuropeptide hormonal mechanisms underlying insect migratory behavior.

Food Science

Functional properties of food proteins.

Development of new processes and technologies for the processing of poultry products.

Immobilization of cells and enzymes on metallic membranes for production of food components.

Mineral binding to components of dietary fiber.

Packaging of food products for maximum quality and extended shelf life.

Combined technologies for enhancement of quality in intact and formed meat products.

Egg product development: sliceable, encased ready-to-reheat whole egg products.

Bacterins from lactic acid bacteria to improve food safety.

Characterization of inhibitors produced by food-bioprocessing propionibacteria.

New membrane separation opportunities in food processing.

Packaging of floral products in modified atmospheres for retail sales.

Modified atmosphere packaging on shelf life of shelled green lima beans.

Extended shelf life of shelled, whole eggs in modified atmosphere.

Packaging systems for micropropagated plants.

Home Economics Research (cooperative with Winthrop College)

Nutritional status and body composition of healthy, black, normal-weight, middle-age females.

Horticulture

Plant germplasm: its introduction, maintenance and evaluation.

Improving plastic mulch and row cover crop systems for vegetable production.

Weed management in cucurbit crops.

Extending shelf life of floricultural crops by manipulation of postharvest environment.

RFLP analysis and DNA fingerprinting in rose cultivars.

New flowering pot plants through chemical growth regulation and/or environmental manipulation.

Ornamental plant production and impact of slow-release nitrogen fertilizer on surface water.

Evaluation of turfgrass cultivars and herbicides.

Improved melon cultivars.

Tall fescue and bermudagrass cultivars for Eastern transition zone turf.

Ornamental herbicide movement, contamination and modification in runoff and surface water.

Nitrogen and carbohydrate balance in episodic plants.

Stress physiology and cultural management of peach.

Breeding improved peach, nectarine and rootstock cultivars.

Light quality influences on plants in liquid spectral filter greenhouses.

Postproduction carbohydrate metabolism in floriculture crops.

Plant Pathology and Physiology

Biochemical and residual properties of pesticides.

Herbicide resistance and metabolism in tissue culture.

Causes and control of diseases of cereal grains with emphasis on powdery mildew of wheat.

Distribution, ecology and pathogenicity of root-knot nematodes.

Control of peach tree short life in South Carolina.

Physiological and molecular genetics of selected plant-bacterial interactions.

Forage legume viruses: identification and genetic resistance for improved productivity.

Control of nematodes on peach and diseases of peach and apple trees.

Gene expression during infection of plants by *Magnaporthe grisea* and *Aspergillus* species.

Identification of unknown orchid viruses.

Control of peach tree short life in South Carolina.

Poultry Science

Reproductive efficiency of turkeys.

Amylases in chickens: molecular basis and effects on growth rate.

Function of a secretory cell, a Dendritic cell, of the bursa of Fabricius.

Functional enhancement of immune system during embryonic development.

Genetic relationships to growth and reproduction in diverse poultry populations.

Effects of cooling avian embryos: immunocompetence and stress.

Production and evaluation of anti-pasteurella antibody from egg yolks.

Immunoglobulin A as an indicator of protection in fowl cholera vaccinated turkeys.

Glutathione (GSH) and GSH S-transferases in the regulation of lipid modulators of cell function.

Function and significance of turkey seminal spermiphages.

Coastal Research and Education Center

Urban horticulture for coastal South Carolina. (Horticulture)

Production potential of summer and fall harvested asparagus in coastal South Carolina. (Horticulture)

Management of insect pests of vegetables. (Entomology)

Storage potential of South Carolina melons using modified atmosphere packaging. (Horticulture)

Improving the export potential of South Carolina watermelons using modified atmosphere packaging. (Horticulture)

Improvement of stand establishment and yield of alternative vegetable crops for South Carolina. (Horticulture)

Edisto Research and Education Center

Arthropod-induced stress on soybean: evaluation and management. (Entomology)

Management of *Hoplolaimus columbus* nematode on cotton and soybean. (Plant Pathology)

Insect management in reduced-cost cotton production systems. (Entomology)

A new reduced tillage, wheat-soybean intercropping system for South Carolina. (Agricultural and Biological Engineering)

Groundwater quality and the fate and management of agrichemicals in the environment.

Summer crop root development and nitrogen dynamics as affected by previous winter crop and tillage.

Pee Dee Research and Education Center

Cotton breeding for improved quality, insect resistance and production efficiency. (Entomology)

Breeding disease and *Meloidogyne arenaria* resistant flue-cured tobacco. (Agronomy and Soils)

Cultural practices and variety testing for flue-cured tobacco. (Agronomy and Soils)

Tobacco disease and nematode control. (Plant Pathology and Physiology)

Influence of mulches on nematodes and diseases in tomato and corn. (Plant Pathology and Physiology)

Biological control of selected arthropod pests and weeds through introduction of natural enemies. (Entomology)

Management strategies for arthropod pests of cotton. (Entomology)

Economic management of tobacco insects pests. (Entomology)

Environmental stress and production practice effects on the growth and physiology of agronomic crops. (Agronomy and Soils)

Soil and plant nitrogen tests for predicting nitrogen fertilization of wheat. (Agronomy and Soils)

Integrated crop management effects on stalk-boring Lepidoptera. (Entomology)

Potential impact of endemic and imported natural enemies on cotton insect pests. (G.S. McCutcheon)

Sandhill Research and Education Center

Production systems for cool season vegetable crops. (Horticulture)

Technical and economical efficiencies of producing and marketing landscape plants. (Horticulture)

Virus and virus-like diseases of woody, deciduous fruit crops. (Plant Pathology and Physiology)

Rootstock and interstem effects on pome and stone fruit trees. (Horticulture)

Microirrigation of horticultural crops in humid regions. (Horticulture)

Rootstock and interstem development for peach cultural systems. (Horticulture)

Technical Contributions

- 3196 INFLUENCE OF CUSO 4 SPECTRAL FILTERS, DAMINOZIDE AND EXOGENOUS GIBBERELIC ACID ON GROWTH OF DENDRANTHEMA X GRANDIFLORUM (RAMAT.) KITAMURA 'BRIGHT GOLDEN ANNE' by N.C. Rajapakse and J.W. Kelly (Horticulture 7-01-91).
- 3197 DISTINGUISHING AMONG BRUISES IN PEACHES CAUSED BY IMPACT, VIBRATION AND COMPRESSION by P.J. Vergano, R.F. Testin and W.C. Newall, (Food Science and Horticulture 7-16-91).
- 3198 SERUM HORMONE AND METABOLITE CONCENTRATION IN FASTED YOUNG BULLS AND STEERS by J.R. Ward, D.M. Hendricks, T.C. Jenkins and W.C. Bridges (Animal, Dairy and Veterinary Sciences and Experimental Statistics 7-18-91).
- 3199 POSTHARVEST QUALITY CHARACTERISTICS OF CULTIVARS OF POTTED ROSE IN RESPONSE TO HOLDING CONDITIONS AND CYTOKININS by D.G. Clark, J.W. Kelly and H.B. Pemberton (Horticulture, Agricultural Research and Education, Texas A&M 7-18-91).
- 3200 BACTERIOCINS: MOLECULAR BIOLOGY (CHAPTER) by S.F. Barefoot, K.M. Harmon, D.A. Grindstead and C.G. Nettles (Food Science 7-19-91).

- 3201 PEACH BRUISING, SUSCEPTIBILITY TO IMPACT, VIBRATION, AND COMPRESSION ABUSE by P.J. Vergano, R.F. Testin and W.C. Newall, Jr. (Food Science and Horticulture 7-19-91).
- 3202 DYNAMIC CHANGES IN THE INTERMEDIATE FILAMENTS OF THE EPITHELIAL CELLS DURING DEVELOPMENT OF THE CHICKEN'S BURSA OF FABRICIUS by I. Olah and B. Glick, (Poultry Science 7-23-91).
- 3203 EFFECTS OF NU-SERUM ON IN VITRO CULTURE OF GOAT (CAPRA HIRCUS) EMBRYOS by B. J. Senn, M.E.W. Richardson and R.S. Bernard (Animal, Dairy and Veterinary Sciences 7-29-91).
- 3204 FLOW CYTOMETRIC DNA ANALYSIS OF NURSE SHARK (GINGLYMOSTOMA CIRRATUM) AND CLEARNOSE SKATE (RAJA EGLAN-TERIA) PERIPHERAL BLOOD CELLS by C. Kendall, S. Valentino, A.B. Bodine and C.A. Luer (Poultry Science and Animal, Dairy and Veterinary Sciences 7-29-91).
- 3205 FAT COMBINATIONS ON LACTATION AND DIGESTION: NUTRIENT DIGESTION AND LACTATION PERFORMANCES OF DAIRY COWS FED COMBINATIONS OF PRILLED FAT AND CANOLA OIL by T.C. Jenkins and B.F. Jenny (Animal, Dairy and Veterinary Sciences 7-29-91).
- 3206 JENSENIIN G, A HEAT-STABLE BACTERIOCIN PRODUCED BY PROPIONIBACTERIUM JENSENII P126 by D.A. Grindstead and S.F. Barefoot (Food Science 7-29-91).
- 3207 EVIDENCE FOR THE SPREAD OF PRUNUS NECROTIC RINGSPOT VIRUS AND THE PRESENCE OF PRUNE DWARF VIRUS IN SELECTED PEACH ORCHARDS IN SOUTH CAROLINA by S.W. Scott, R. Walker Miller and E.J. Bachman (Plant Pathology and Physiology 7-31-91).
- 3208 THE USE OF NUCLEIA ACID PROBES FOR THE DETECTION OF PRUNUS NECROTIC RINGSPOT VIRUS AND PRUNE DWARF VIRUS by S.W. Scott, V. Bowman-Vance and E.J. Bachman (Plant Pathology and Physiology 7-31-91).
- 3209 LACTATIONAL RESPONSE OF JERSEY COWS TO BOVINE SOMATOTROPIN ADMINISTERED DAILY OR IN SUSTAINED RELEASE by B.F. Jenny, L.W. Grimes, F.E. Pardue, D.W. Rock and D.L. Patterson (Animal, Dairy and Veterinary Sciences 8-12-91).
- 3210 CHARACTERIZATION OF DEXTRIN HYDROLYSIS BY GLUCAMYLASE IMMOBILIZED ON FORMED-IN-PLACE METALLIC MEMBRANES by H.J. Wang and R.L. Thomas (Food Science 8-12-91).
- 3211 PLASMA CELL PROLIFERATION THE CHICKEN HARDERIAN GLAND by M.L. Savage, I.H. Olah and T.R. Scott (Poultry Science 8-13-91).
- 3212 THE EFFECT OF ALKALOIDS AND SEED EXTRACTS OF ENDOPHYTE INFECTED TALL FESCUE ON PROLACTIN SECRETION IN AN IN VITRO RAT PITUITARY by J.R. Strickland, D.L. Cross, T.C. Jenkins, R.J. Petrosky and R.G. Powell (Animal, Dairy and Veterinary

Sciences, USDA, ARS, National Center for Agricultural Utilization Research, Bioactive Constituents Research 8-16-91).

- 3213 CROP ROTATION AND NEMATICIDE APPLICATION AFFECTS THE PREDOMINANCE OF MELOIDOGYNE SPP. by B.A. Fortnum and R.E. Currin III, (Plant Pathology and Physiology 8-20-91).
- 3214 DRAWING AS A MEANS OF ALTERNATIVE EDUCATION IN BOTANICAL GARDENS by R.D. Bull, L.H. Blanton and M.T. Haque (Horticulture and Agricultural Education 8-20-91).
- 3215 REGISTRATION OF "HAGOOD" SOYBEAN by E.R. Shipe (Agronomy and Soils 8-20-91).
- 3216 ESTABLISHMENT CHARACTERISTICS AND COMPETITIVENESS OF HYBRID BERMUDAGRASS CULTIVARS by B.W. Pinkerton and J.S. Rice (Agronomy and Soils 8-20-91).
- 3217 COMMON LAMBSQUARTERS (CHENOPODIUM ALBUM) CONTROL WITH NON-SELECTIVE HERBICIDES by J.M. Higgins, T. Whitwell and J.E. Toler (Agronomy and Soils and Experimental Statistics 8-28-91).
- 3218 COMPARISON OF CROP COVER MEASURING SYSTEMS by J.C. Hayes and Y.J. Han (Agricultural and Biological Engineering 8-28-91).
- 3219 DIETARY FAT AND GASTROINTESTINAL TRANSIT TIME OF FOOD AND FAT UTILIZATION IN BROILER CHICKENS by A. Golian and D.V. Maurice (Poultry Science 9-03-91).
- 3220 ECONOMICS OF CORN DRYING IN SOUTH CAROLINA by J.M. Bunn and C.A. DeWitt (Agricultural and Biological Engineering 9-03-91).
- 3221 SELECTIVE INHIBITORS OF METHYL PARATHION-RESISTANT ACETYLCHOLINESTERASE FROM HELIOTHIS VERESCENS by T.M. Brown and P.K. Bryson (Entomology 9-03-91).
- 3222 RESISTANT ACETYLCHOLINESTERASE OF THE TOBACCO BUDWORM HELIOTHIS VIRESCENS by T.M. Brown (Entomology 9-9-91).
- 3223 PLECOPTERA AND EPHEMEROPTERA OF WILDCAT CREEK, SC by S.M. Daniels and J.C. Morse (Entomology 9-11-91).
- 3224 CONFINEMENT AND TRANSPORT-INDUCED STRESS IN WHITE BASS (MORONE CHRYSOPS) X STRIPED BASS (M. SAXATILIS) HYBRIDS: EFFECT OF CALCIUM AND SALINITY by C.R. Weinrich, J.R. Tomasso and T.I. J. Smith (AFW, SCWMRC 9-11-91).
- 3225 FATTY ACYL AMIDES RESIST BIOHEDROGENERATION by N. Fatouhi and T.C. Jenkins (Animal, Dairy and Veterinary Science 9-11-91).
- 3226 THE EFFECT OF HERBICIDES ON SHIPPING QUALITY OF LANDSCAPE PLANTS by J. Hubbard, T. Whitwell and J. Kelly (Horticulture 9-16-91).
- 3227 DESIGN, CONSTRUCTION AND MAINTENANCE: FACTORS IN HOME MOSITURE IN THE SOUTHEAST by L.Gardner, F.W. Fleming

and A. Griffith (Home Economics, Dept. of Building, Heriot-Watt University, Edinburgh, Scotland, UK 9-20-91).

- 3228 INTERPRETATION OF LIGHT QUALITY MEASUREMENTS AND PLANT RESPONSE IN SPECTRAL FILTER RESEARCH by N.C. Rajapakse, R.K. Pollack, M.J. McMahon, J.W. Kelly and R.E. Young (Horticulture and Agricultural and Biological Engineering 9-30-91).
- 3229 NEW MICROCADDISFLY (TRICHOPTERA: HYDROPTILIDAE) RECORDS FOR KENTUCKY by Michael A. Floyd (Entomology 10-03-91).
- 3230 GROWTH OF RELAY INTERCROPPED SOYBEAN by Wallace, Whitwell, Palmer, Hood and Hall (Agronomy and Soils 10-08-91).
- 3231 HYDROGENATED FAT IN DAIRY RATIONS by T.C. Jenkins and B.F. Jenny (Animal, Dairy and Veterinary Science 10-9-91).
- 3232 OVARIAN FOLLICULAR DYNAMICS, AND DURATION OF ESTRUS AND DIESTRUS ON PUREBRED ARABIAN VS. QUARTER HORSE MARES by M.A. Dimmick, T. Giminez and R.L. Schlager (Animal, Dairy and Veterinary Science 10-11-91).
- 3233 IS NUTRITIONAL ANESTRUS PRECIPITATED BU SUBFUNCTIONAL CORPORA LUTEA IN BEEF COWS? by F.N. Schrick, J.C. Spitzer, T. Giminez, D.M. Henricks, T.C. Jenkins and B.B. Plyler (Animal, Dairy and Veterinary Science 10-11-91).
- 3234 PEACH VIBRATION BRUISING: THE EFFECT OF PAPER AND PLASTIC FILMS BETWEEN PEACHES by P.J. Vergano, R.F. Testin, A.C. Choudhari and W.C. Newall, Jr. (Food Science 10-23-91).
- 3235 AN INITIAL INVESTIGATION OF THE STATUS OF BORRELLIA BURGDORFERI AND ITS SUSPECTED PRIMARY VECTOR, IXODES SCAPULARIS, IN SOUTH CAROLINA by W.E. Barton, E.W. Gray and D. Shipes (Entomology 10-23-91).
- 3236 NUTRIENT UTILIZATION IN LIQUID/MEMBRANE SYSTEM FOR WATERMELON MICROPROPAGATION by N.V. Dessamero, J.W. Adleberg, S.A. Hale, R.E. Young and B.B. Rhodes (Agricultural and Biological Engineering and Horticulture 10-28-91).
- 3237 COST-EFFECTIVE WEED CONTROL IN SOYBEANS WITH CULTIVATION AND BANDED HERBICIDE APPLICATIONS by Poston, Murdock and Toler (Agronomy and Soils 10-30-91).
- 3238 EFFECTIVE WEIGHT MAINTENANCE TECHNIQUES OF HEALTHY, NORMAL WEIGHT MIDDLE-AGE WOMEN by S.F. Stallings and P.G. Wolman (Human Nutrition/Center for Home Economics Research — Winthrop College 11-01-91).
- 3239 RESTRAINED EATING AND DEPRESSION IN NORMAL-WEIGHT AND OBESE MIDDLE-AGE WOMEN by S.F. Stallings, C.P. Spillers, P.G. Wolman and R. Baumgarte (Psychology and Human Nutrition, Winthrop College 11-01-91).

- 3240 CHOLESTEROL IN EGGS FROM DIFFERENT SPECIES OF BIRDS DETERMINED BY CAPILLARY COLUMN GLC by D.V. Maurice, S.F. Lightsey, K.T. Hsu, T.G. Gaylord and R.V. Reddy (Poultry Science 11-07-91).
- 3241 ANTI S-100 ANTIBODY RECOGNIZED ELLIPSOID ASSOCIATED AND OTHER DENTRITIC CELLS IN THE CHICKEN SPLEEN by M. Gallego, I. Olah, E. Cacho and B. Glick (Poultry Science 11-7-91).
- 3242 A PRELIMINARY SURVEY OF THE CHIRONOMIDAE (DIPTERA) OF COSTA RICA by C.B. Watson and M.W. Heyes (Entomology 11-15-91).
- 3243 ECONOMIC ASPECTS OF PLANT VIRUS DISEASES by O.W. Barnett (Entomology 11-15-91).
- 3244 PREDATORY BEHAVIOR OF THE BASILICA SPIDER, MECYNOGEA LEMNISCATA (ARANEAR, ARANEIDAE) by M.B. Willey, M.A. Johnson and P.A. Adler (Entomology 12-02-91).
- 3245 CULTURE OF PORCINE EMBRYOS IN THE ABSENCE OF BOVINE SERUM ALBUMIN by J.A. Russler-Long, J.F. Dickey, W. Jochle and M.E. Richardson (Animal, Dairy and Veterinary Sciences 12-02-91).
- 3246 CRINCONEMELLA XENOPLAX AND MELOIDOGYNE INGOFNITA AFFECT CONTENT OF PRECURSORS OF ETHYLENE IN PEACH by M.B. Riley, G.E. Carter and A.P. Nyczepir (Plant Pathology and Physiology and USDA ARS, Southeastern Fruit and Tree Nut Research Laboratory, Byron, GA 31001).
- 3247 CHANGES IN LEAHATE CONCENTRATIONS OF N, CA, MG FROM A BARK-BASED MEDIA WITH SIERRA 17-6-10 PLUS MINORS CONTROLLED RELEASE FERTILIZER by J.S. Kuehny and M.C. Halbrooks (Horticulture 12-13-91).
- 3248 PICOLINIC ACID-INDUCED DIRECT SOMATIC EMBRYOGENESIS IN SWEET POTATO (IPOMOEA BATATAS L., LAM.) by N.V. Desamero, B.B. Rhodes and D. Decoteau (Horticulture 12-13-91).
- 3249 POSTEMERGENCE GRASS HERBICIDE ACTIVITY CHANGES WITH ADJUVANT AND PH AND SODIUM LEVEL IN SPRAY SOLUTIONS by T. Whitwell, K.E. Kalmowitz and G.S. Stapleton (Horticulture 12-16-91).
- 3250 REGISTRATION OF "CLEMSON 100" WINTER BARLEY by W.D. Graham, Jr. (Agronomy and Soils 1-02-92).
- 3251 ESTROGENS AND PROSTAGLANDIN F2 ALPHA IN SEMEN AND BLOOD PLASMA OF STALLIONS by R. Claus, M.A. Dimmick, T. Gimenez and L.W. Hudson (Animal, Dairy and Veterinary Sciences and University of Hohenheim, Stuttgart, Germany 1-02-92).
- 3252 FEEDING BEHAVIOR OF CRINCONEMELLA XENOPLAX IN MONOXENIC CULTURES by S.W. Wescott II, and R.S. Hussey (Plant Pathology and Physiology, Clemson University and University of Georgia 1-02-92).

- 3253 HUMINAL BIOHYDROGENATION OF CALCIUM LINOLEATE AND LINOLEOYL METHIONINE IN SHEEP by N. Fotouhi and T.C. Jenkins (Animal, Dairy and Veterinary Sciences 1-13-92).
- 3254 DIFFERENTIAL RESPONSE OF BERMUDAGRASS CULTIVARS TO HEADFIRES AND BACKFIRES by B.W. Pinkerton and J.S. Rice (Agronomy and Soils 1-15-92).
- 3255 FEASIBILITY OF GLOBAL IMAGE ANALYSIS IN FREQUENCY DOMAIN by Y.J. Han and Y. Feng (Agricultural and Biological Engineering 1-15-92).
- 3256 RESISTANCE OF PALMER AMARANTH (ANANAMTHUS PALMERI) TO THE DINITROANILINE HERBICIDES by Gossett, Toler and Murdock (Agronomy and Soils 1-15-92).
- 3257 GELATION OF WHEY PROTEIN CONCENTRATES by A.E. Holley, C.V. Morr and C.L. Weller (Agricultural Engineering and Food Science 1-15-92).
- 3257 FEEDING-SITE PREFERENCE OF FALL ARMYWORM, CORN EARWORM, AND GRANULATE CUTWORM (LEPIDOPTERA: NOCTUIDAE) ON 'FLORUNNER' PEANUT by S.S. Deitz, J.W. Chapin and P.H. Adler (Entomology 1-16-92).
- 3258 BACTERIOCONS FROM DAIRY PROPIONIBACTERIA AND INDUCIBLE BACTERIOCINS OF LACTIC ACID BACTERIA by S.F. Barefoot and D.A. Grindstead (Food Science 1-20-92).
- 3259 DRYING RATE CONSTANTS FOR YELLOW DENT CORN AS AFFECTED BY FATTY ACID ESTER TREATMENTS by C.L. Weller and J.M. Bunn (Agricultural and Biological Engineering 1-27-92).
- 3260 ORNITHINE DECARBOXYLASE IN PORCINE REPRODUCTIVE TISSUES: II. ENZYME ACTIVITY IN SELECTED TISSUES by S.C. Pak, K. Mitchell, J.R. Diehl and D.M. Henricks (Animal, Dairy and Veterinary Sciences 2-04-92).
- 3261 ORNITHINE DECARBOXYLASE IN PORCINE REPRODUCTIVE TISSUES: I. SUPPRESSION OF LH SURGE BY DIFLUOROMETHYLORNITHINE IN GILTS by S.C. Pak and J.R. Diehl (Animal, Dairy and Veterinary Sciences 2-04-92).
- 3262 IN VITRO VARIATION OF ACREMONIUM COENOPHIALUM by N.H. Ferguson, J.S. Rice and R.H. Petroski (Agronomy and Soils 2-10-92).
- 3263 NONDESTRUCTIVE DETECTION OF SPLIT-PIT PEACHES by Young J. Han, S.V. Bowers III, and Roy B. Dodd (Agricultural and Biological Engineering 2-10-92).
- 3264 PRODUCTION, CHARACTERIZATION AND USE OF MONOCLONAL ANTIBODIES AGAINST ACREMONIUM COENOPHIALUM by S.W. Scott (Plant Pathology and Physiology 2-10-92).

- 3265 DUAL-FREQUENCY CONTINUOUS-WAVE RADAR FOR SURFACE DETECTION by B. Shin, R.B. Dodd and Y.J. Han (Agricultural and Biological Engineering 2-10-92).
- 3266 NITROGEN MANAGEMENT AND DETERMINATION OF CRITICAL LEAF NITROGEN CONCENTRATION FOR JAPANESE BUNCHING ONIONS by J.R. Johnson and C.D. Johnson (Horticulture, Sandhill REC 2-26-92).
- 3267 PEACH BRUISING: THE CRITICAL DROP HEIGHT FOR COMMER-
CIALLY SIGNIFICANT IMPACT BRUISES by P.J. Vergano, R.F. Testin, W.C. Newall and T. Trezza (Food Science and Horticulture 2-26-92).
- 3268 ANTIBIOSIS REVISITED: A NEW LOOK AT AN OLD SUBJECT by S.F. Barefoot and C.G. Nettles (Food Science 2-26-92).
- 3269 TARGET FLOWMETER USED IN A DAIRY PROCESSING PLANT by A.K. Greene, V.B. Smith, C.R. Smith and J.A. Hanckel (Animal, Dairy and Veterinary Sciences 3-03-92).
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COOPERATIVE EXTENSION SERVICE

As the educational outreach arm of the University Division of Agriculture and Natural Resources, the Cooperative Extension Service provides information and statewide continuing education programs that can make life easier and more enjoyable for every South Carolinian. The programs cover 16 disciplines relating to agriculture and natural resources, home economics, 4-H and youth development and community development. In addition to general education information, special programs are included for limited-resource farmers and the economically disadvantaged.

Funded by federal, state and county governments, the Extension Service was created in 1914 as a nationwide system designed to carry education from land-grant universities to the people. For 78 years, Extension has worked closely with South Carolinians helping them build better lives through dissemination of practical, useful information within its assigned areas of responsibility.

Originally conceived to help rural people, Extension responded to the changing needs of those it served by broadening its scope of activities to include urban and suburban problems.

Clemson, through its Extension Service, maintains an office manned by agents in each county. A professional staff of Extension subject-matter specialists at the University and four Research and Education Centers around the state compiles information from research and translates it into information the people of South Carolina can use day-to-day.

From basic nutrition information to irrigation field tours, Extension staff members and volunteers are teachers carrying University educational programs to all areas of the state.

The Extension program is organized around these broad categories: agriculture and natural resources (including special programs for limited resource farmers), 4-H and youth development, home economics (including the Expanded Food and Nutrition Education Program), community development and 1890 programs conducted by S.C. State College, in cooperation with the Clemson Extension Service.

As part of its four-year planning cycle, the Clemson Extension Service has developed a new plan for program delivery through the mid-1990s. Nearly 1,000 South Carolinians helped Extension identify major problems facing the state and prepare a new plan to address those problems. In addition, Extension's four-year plan outlines educational activity for base and mandated programs related to its mission.

Drawn up in 1990 and 1991, the plan was developed in concert with the S.C. State College Extension Program. It's now guiding the development and implementation of Clemson Extension educational programs in such areas as water and food quality, management of other natural resources and youth development.

The Clemson Extension plan of work, which meshes well with the University's strategic plan on the environment, identifies and addresses issues of concern to a broad spectrum of the state's population.

In putting it together, Extension's state staff studied the latest demographic information on the area. Situational statements were compiled by Extension faculty members on campus and in Clemson Extension offices in each county.

These statements were reviewed by priority identification committees in every county. These committees were made up of a cross section of local county residents. Statewide, more than 750 people served on these committees.

They met, identified local educational needs, and prioritized them. Those needs related to Extension's mission were consolidated at the state level. The list was studied by members of the State Extension Advisory Council and a team of 22 Extension professionals. They recommended nearly 100 items to include in the plan of work.

From among the issues identified, priority will be given to six statewide issues:

- Natural resources management;
- Food quality, safety and nutrition;
- Profitability and sustainability of agriculture;
- Waste management by industry (including agriculture), municipalities and consumers;
- Water quality; and
- Youth at risk.

Five of these six statewide thrusts have the environment at the center of their focus. The plan includes 33 educational program thrusts for agriculture and natural resources, 22 for home economics, 14 for youth development and four for community development. Reports from these thrusts follow.

Natural Resources Management

Extension has conducted programs and educated people on best management practices (BMP) to improve the quality of natural resources. Two regional wetlands programs in Dorchester and Georgetown counties drew 258 landowners.

Crop damage from deer is a major problem for crop producers in many parts of the state. A joint program between the S.C. Wildlife and Marine Resources Department and Clemson Extension seeks to determine management alternatives to reduce crop damage from deer. A pilot area has been established in Hampton County to implement and assess deer population control alternatives. Programs were conducted for professional foresters and other resource professionals on the use of BMP's on wetlands forests and wildlife areas.

About 300 people took part in two regional wetlands policy education programs, and more than 350 people participated in programs on public policy issues related to natural resources.

Profitable and Sustainable Agriculture

Sustainable agriculture means different things to different people, but most agree that to be sustainable an operation must be profitable and in the long run needs to avoid the depletion and deterioration of soil, water and other natural resources. A new sustainable agriculture newsletter was developed to provide information focused on specific ways to increase profitability of cotton, soybeans, tobacco, small grains and corn. This and other newsletters containing sustainable information reach more than half the farmers in the state.

A series of Productivity, Efficiency and Profits workshops were held in the state to promote agronomic, marketing and pest management procedures which can enhance both the profitability and sustainability of farming.

A field day featuring ideas, techniques, equipment and enterprises especially suited for small farms was planned for the fall of 1992. About 20 presentations on the program were designed for small-scale farmers.

Waste Management

Passage of the S.C. Solid Waste Policy Management Act of 1991 stimulated Extension involvement in waste management programming. To help communities solve solid waste management problems, an inter-disciplinary Extension waste management program team has been formed.

Current Extension waste management activities include work with community recycling centers, 4-H composting demonstration projects, household hazardous waste disposal, and programs to encourage environmentally responsible purchasing and disposal decisions. A recent survey to which Extension agents in 31 counties responded showed a wide range of involvement in waste management programs. A sampling of the programs included: recycling (10 counties), hazardous household waste disposal (five counties), enviroshopping (four counties), pesticide disposal (one county) and municipal composting (four counties). In several counties, agents are working with industry to develop uses for industrial byproducts.

Work with local government officials has included a workshop on Municipal Yard Waste Composting which was attended by 90 participants.

Water Quality

Corn has been identified by the Extension's water quality team as the crop associated with greatest agricultural nitrate threat to water quality in the state. Agents in 25 counties have been assigned to work with farmers to establish baseline data on nitrate use on corn. Through farm visits, the agents identified the average long term yield of the farmer and actual application rates of nutrients. From this data we will identify the three practices that have the greatest potential for reducing nitrogen fertilizer rates.

Corn also has been identified as the crop, and atrazine has been identified as the chemical posing the greatest threat to water quality in targeted counties in the state. Agents are determining the actual rate of atrazine being applied to corn and will track the application rates over several years to document reductions.

Poultry has been identified as the animal unit posing the greatest threat to water quality in 10 targeted counties in the state. A statewide in-service training program was held to train agents on practices that can help hold animal waste residue to an acceptable level.

Commercial Agriculture — Animal Industries

Aquaculture

Aquaculture is the fastest growing sector of production agriculture in the United States with growth of about 20 percent each year during the 1980s. Aquaculture is in a period of consolidation and change. The Clemson Extension Service helped stage several production workshops for new producers and worked on improving the productivity of existing farms. As a result of these programs, about 75 of the 300 producers in the state already have adopted new practices (such as combination catfish stocking) that are dramatically increasing their total production.

Extension fish disease diagnostic laboratories at Clemson and at Estill handled a 25 percent increase in cases this year.

Beef

This year 824 beef producers requested Extension information on expected progeny difference (EPD) values. If these requests were from the beef farm in South Carolina (a herd size of about 20 head) and they select sires that reflect a 10 pound improvement in milk value, the results will be dramatic. A 10 pound EPD improvement for milk reflects an additional 10 pounds per calf from each daughter retained. If five daughters were kept per year, the increase is 50 pounds of calf at 80 cents per pound, this would reflect a \$40 increase per calf produced. If the five daughters raise seven calves each during their expected lifetime, that's \$280 for every five replacements retained or \$1,400 over their lifetime. If we assume the EPD information reflected a difference of 15 pounds due to growth (gain up to weaning), then for 20 females, that is a total of 300 additional pounds per year. Over a five-year period, which most bulls are used, that is an additional 1,500 pounds or \$1,200 per farm. On 824 farms, the additional gain value would result in an additional \$988,800 due to gain and an additional \$230,720 due to additional gain through added milk from the retained replacement heifers. Cattlemen selecting breeding stock based upon EPDs can make beef cattle return profits and become a farm enterprise of respect.

Dairy

S.C. milk production and dairy receipts for 1991 reached a record low. The state dairy herd was reduced to 33,000 milk cows — from 35,000 in 1990 — which produced 405,000,000 pounds of milk with farm milk receipts of \$50,329,000, down from \$73,650,000 in 1990. The main reason for the reduction in milk receipts was a decrease in milk prices from \$16.47 per hundred weight in 1990 to \$13.91 in 1991.

Because of unrest in the milk market, 10 dairy meetings on the price situation were held during the year. Clemson Dairy Extension personnel presented information to producer groups, industry and political groups. Dairy Extension programs were conducted on production and financial records. Special programs were presented to dairy producers on ways to better utilize DHI production records. A program which emphasized improved efficiency on dairy farms by better utilization of production records was presented to 30 dairy consultants. Dairy producers in the state continue to make great strides in this important record keeping program.

Beginning in July, any dairy producer who ships adulterated milk will have his or her permit suspended for two days and will be required to participate in a drug residue prevention program. Clemson University Dairy Extension personnel have been asked to take the lead educational role in this national Milk Quality Assurance Program.

Horses

The Cooperative Extension Service has had considerable influence on South Carolina's horse industry during the past year as the Garrison Livestock Arena began operation. The number of people who come to campus for horse events has increased drastically (we estimate more than 25,000, but do not have a solid count). The clinics and seminars have a direct educational impact that improves the management levels of horse owners. The economic impact of events during this time is in excess of \$2 million.

We have emphasized basic management for recreational horse owners at the county level. Our county personnel are well versed in forage production and are providing these educational programs routinely. This is evident as we see more local hay moving into the horse market. The recreational horse owner is a new audience for many of our county offices. As the horse owners learn of the vast amount of information available through the county extension office, they are becoming comfortable using it.

Poultry

One focus of Extension's poultry program is to improve housing and ventilation systems for commercial poultry production. Past accomplishments in this area resulted in a grant from the Governor's Energy Office, which will allow the development of a three house demonstration farm. To address current issues such as the environment, food safety and animal welfare, a multimedia, interactive video presentation entitled "Futuristic Poultry Production" was developed. This program was presented at the S.C. Poultry Federation Annual Conference and at the International Poultry Exposition, Atlanta. A new "Small Flock Manual" was published to help small flock owners with basic management practices.

During the past year, the poultry science department has been involved with Extension's Food Safety Team in a workshop to educate journalists on risk assessment and food safety. Another educational effort the department was involved in was the Mid-Atlantic Layer Management Workshop. This was a regional effort to bring together the layer and support industries of Virginia, North Carolina and South Carolina and surrounding states. Another project the department has been supporting is the field research of factors affecting eggshell quality of our egg producers for two of our contract egg companies. The department also has given several presentations on proper handling of poultry waste and dead bird disposal.

Swine

The S.C. swine industry shows evidence of growth and continued production improvements. Production measurements have been gathered at the S.C. Swine Evaluation Center in Pontiac over an 18 year period.

The Clemson Swine Program has received much regional interest due to the development and demonstration of low energy swine buildings designed for southern production. Clemson received nearly 4,000 requests for these plans in 1991-1992.

During the past year Clemson Extension agents and specialists helped 929 swine producers taking part in swine health programs, assisted 299 adopt new facility designs, and provided information on swine genetic improvement for 409 farmers. Financial management information was provided to 149 swine producers. In January the Hog and Pig Report of USDA indicated that South Carolina was the 20th largest state in total pork production and 18th in sow numbers. The state is a leader in the fight to eliminate pseudorabies. In fall of 1992, South Carolina was to be placed in stage four of this program. Only four other states have reached this level. This status is expected to increase out of state contractor interest in swine production in South Carolina.

Commercial Agriculture — Agronomic Crops

Cotton

South Carolina cotton acreage increased from 154,000 in 1990 to 210,000 acres in 1991. A new record lint yield of 786 pounds per acre was recorded. The crop was valued at more than \$110 million, making cotton the second leading cash row crop in the state.

A survey was conducted to establish a base of pesticide use in cotton production. The results were being summarized as this report was prepared. In 1992, 160 people attended Clemson cotton scouting schools at two locations in the state. Experience and grower contacts indicate insecticide usage was reduced from an average of 12 applications before boll weevil eradication to six applications in 1991.

Seedling disease and nematode problems are increasing in cotton. Spring field surveys show seedling disease in every field. The surveys showed nematode infestations in 40 to 50 percent of South Carolina's fields. Three regional cotton plant mapping meetings attracted 134 people. County Extension Agents in the major cotton growing counties were trained to map cotton, and growers are being encouraged to map one or more fields this year. More than 600 growers improved their knowledge of cotton plant mapping this year. Plant mapping is being used by 185 growers as a guide to determine when a growth regulator is needed, when additional irrigation may be helpful, and when insect management practices may need to be intensified.

Forage Crops

Forages may be the state's most under utilized crop resource because of inefficient production and harvesting practices. But interest in forages is increasing. Major emphasis on improving hay quality in South Carolina included the development of an in-service training package for agents in the counties, complete with a video tape, slide set and newly developed hay quality bulletin. Extension specialists wrote articles for the S.C. Land Resources Commission newsletter and the S.C. Department of Agriculture Market Bulletin.

In Abbeville County, 57 participants paid \$25 each to take part in a six-week forage workshop. The workshop was reinforced six weeks later with a field day with stops at four farms.

Forage field days were held in Abbeville, Anderson, Chester, Laurens, Richland, Saluda, Spartanburg and Union Counties. Three new forage leaflets were published, and six pasture weed management demonstrations were conducted. Close cooperation with the new S.C. Forage and Grassland Council continued.

Extension's forage program also provides information on goats, wildlife, agroforestry and multiple land management.

Grain Crops

About 670 persons participated in five Extension and two industry field days, 13 county production meetings, 22 on-farm demonstrations and a statewide wheat meeting. The emphasis of the wheat educational effort is on land preparation, seeding rates, varietal selection, nitrogen management and pest management.

The impact of the Extension educational program is apparent from annual surveys of grower fields. Grower compliance with recommended Hessian fly management practices was very high in 1992. Extension field tests and other educational efforts have been instrumental in raising wheat yields in recent years. The projected 1992 wheat yield is a record 46 bushels per acre.

Activities summary:

- 13 production meetings
- 23 on-farm demonstrations
- 11 newsletters
- 33 wheat field surveys in 10 counties

- 7 field days/tours
- 2 television programs
- 1 revised publication

Oil Seed Crops

Soybeans and peanuts continue to be the major oil seed crops produced in South Carolina. Interest is building in crops such as canola and flax, and Extension is conducting field studies on best management practices for these crops.

Extension has developed programs on improved production and marketing programs. Included in these have been Productivity, Efficiency and Profit (PEP) workshops; predator control schemes and IPM programs.

During the year Extension agents in 27 counties planned educational programs reaching 1,350 oil seed crop producers, and they conducted county tours at which 200 producers indicated they would incorporate new ideas in their plans. State field days for corn, soybeans and peanuts each drew several hundred farmers.

On-farm demonstrations were done to show farmers how to reduce problems of deer grazing by the use of drilling insect resistant varieties. At least 200 producers benefited from these demonstrations.

Tobacco

A multifaceted program to reduce maleic hydrazide residue was detailed. Much of the effort is on using improved sucker control programs that insure season-long sucker control with reasonable MH levels. These efforts include on-farm tests, a grower sampling program in two counties, utilizing numerous proven Extension tools and involvement in a Regional Growth Regulator Research project. Efforts to reduce unripe, immature tobacco being offered for sale also have proven productive.

Numerous growers are adopting new innovative labor saving transplant techniques. Extension activities planned for 1992 include eight on-farm demonstrations on variety selection, Ridomil or fumigation management and rotation.

Commercial Agriculture — Horticultural Crops

Fruit Crops

Emphasis of Extension fruit programs was on integrated disease, insect and weed management; improving cropping reliability and decreased cost of production. Seven county, area, statewide and regional meetings were conducted to convey the latest in production technology.

An IPM grant was used to develop a network of five weather stations. These report weather data that is used in a computer program that helps fruit growers make management decisions. Case studies indicate that growers who use computer decision aides have less disease problems in their orchards. Numerous demonstrations were conducted in grower fields and at experiment stations. Special Local Needs and Section 18 labels were obtained for fruit producers to address five special pest control problems. The peach crop in 1992 was about 150 million pounds, well below the normal 350 million pounds. Most of the reduction was due to frost.

Ornamental Crops

Extension educational programs for the nursery and greenhouse industries continue to be a high priority. Yearly short courses are conducted by Extension in cooperation with the nursery and greenhouse state associations. In 1992, the nursery shortcourse drew more than 1,000 persons.

Numerous news releases by Extension on disease management were produced this year. Surveys were conducted this year on Bacterial leaf scorch which is an important contributor to decline and death of shade trees in the United States. The survey indicates that 27 percent of trees from 19 S.C. counties tested positive for the bacterium including oaks, sycamores and maples.

Turf

A statewide in-service training was conducted in Columbia this year for county agents with responsibilities for consumer (home lawn) and commercial turfgrass management. Extension personnel supervised a three-day conference for golf course workers. The program emphasized turfgrass environmental issues from pesticides to water use and source. The Extension turf team helped with analyses and recommendations for several hundred Plant Problem Clinic turfgrass sample reports.

Vegetable Crops

In 1992, for the first time, all S.C. commercial tomato growers participated in an integrated pest management program. Other vegetable producers were slower to adopt IPM ideals, but due primarily to Extension efforts, 971 vegetable growers reported that in 1992 they followed at least some IPM practices. This is an increase of 20 percent over 1991.

Historically, vegetable producers have been heavy users of fertilizers and irrigation water. The use of plastic mulch, drip irrigation and fertigation can greatly reduce the amount of fertilizers leaching into the ground water, and also reduce the amount of irrigation water required to produce a crop. Extension meetings, publications and demonstrations have stressed use of these production practices. A two-day program in Columbia was dedicated to information on these practices.

Commercial Agriculture — General

Energy and Engineering Issues

Reports indicate a total of 5,979 audience contacts were made by Extension in this area last year. About 150 greenhouse operators participated in energy management training via a video conference and county meetings. Producers built 50 low energy livestock facilities in the state. Several maintenance training sessions were held. Six counties and three states (Texas, Missouri and Nebraska) took part in a pump efficiency video conference. A video conference was broadcast on energy efficient swine housing. Agricultural production facilities plans were distributed to 2,434 clients. Two grain aeration programs were done for the "Early Riser" television show in Columbia.

Economics — Agricultural Marketing

Extension provided information to livestock producers on evaluating the value of whole cottonseed as feed to assist in marketing the large increase in seed. Also assisted ginners and growers in evaluating storage/marketing alternatives. Based on an extensive survey, Clemson Extension economists wrote *Use and Perceptions of Extension Programs by Farmers in Four Southern States*. The findings indicated that Extension reached two thirds of commercial farmers each year and that its programs were rated high in quality.

Presentations were made and outlook information provided to 250 S.C. fruit producers. Four state and regional presentations were made on marketing of meat goats. A New York slaughter house bought 30,000 goats from South Carolina and Georgia in 1991. This is a developing industry.

Clemson Extension agricultural economists planned and conducted an Ag*SAT teleconference, "NAFTA, U.S.-Mexico Free Trade." Thirty one states, Washington, DC and Puerto Rico participated. A report on the impact of NAFTA on the U.S. dairy industry was prepared for the American Farm Bureau Research Foundation. Presentations also were made to 200 vegetable producers about NAFTA and its impact on S.C. produce.

Economics — Farm Financial Management

- Detailed financial analysis for 52 farmers in the farm management associations was provided. Annual Ag. Lenders School for lenders from North Carolina, South Carolina and Georgia was conducted.
- Completed case financial analysis for a national project with the National Cattlemen's Association on financial analysis of cow-calf operations. This financial analysis program will be available nationally to beef cattle producers to use as a financial management tool for improving income.
- Prepared 65 enterprise budgets for publication. Emphasis was on tobacco, cotton, corn and peanut budgets. More than 10,000 have been distributed.
- Conducted a seven-state study in the southern region of the soybean crop insurance program. Organized and conducted six income tax workshops for income tax preparers. Nine hundred tax professionals enrolled in the courses. Participated in a state committee organized by the U.S. Department of Labor to keep farmers informed about migrant labor problems and legal requirements.

Farm Safety

Agriculture annually has ranked as the first or second most dangerous industry. More than 600 persons took part in Extension educational farm safety programs last year. A farm safety presentation on child farm injury prevention was made in Wisconsin to a national audience of 150 safety experts. A national farm safety conference was hosted in South Carolina with more than 90 attending.

Three farm accident rescue training sessions were held, resulting in 92 rescue personnel receiving training in farm accident rescue techniques. A shorter farm accident rescue seminar was held for 42 people.

Food Processing and Packaging Technologies

Extension's food science program focused on educational and advisory activities to enhance competitiveness through (a) adherence to good manufacturing practices, (b) adoption of total quality management procedures, and (c) optimization of processing efficiencies. Accomplishments for the year follow:

- Delivery of 56 training sessions, five short courses and 16 lectures attended by more than 1,400 employees and managers of 225 in-state and 200 national companies, six professional/trade association, and 33 other state agencies on total quality management procedures.
- Conducted more than 65 on-site advisories for 20 South Carolina firms to promote adoption of improved food processing practices and/or packaging technologies.
- Dissemination of 70 food information memorandums to promote awareness of changes in federal and state food laws.
- Provided 750 informal advisory responses to S.C. inquiries on food safety, preservation, packaging, labeling or starting a commercial food venture.

Home Grounds and Gardens

Programs were developed to educate professional and non-professionals in the establishment and maintenance of landscapes, fruit and vegetable gardens, and lawns. Programs also were developed for Extension Master Gardener volunteers to facilitate delivery of information to S.C. residents.

Among programs were:

- a 12-part composting series done for an Abbeville cable television station and a number of garden, landscape and nursery presentations for 1,000 persons (including professionals) at Florence.

- 735 garden store operators and staff participated in Extension training.
- 960 Master Gardeners were trained. They donated 2,498 hours of volunteer.

Integrated Pest Management (IPM)

All commercial tomato producers near the coast were involved in a grower-funded IPM program in 1992. They have reduced pesticide use by an estimated 30 percent since 1982. Results of a statewide survey indicated that 971 (70 percent) of all S.C. vegetable growers followed some IPM practices.

All commercial cotton producers participate in an IPM program that is coupled with the boll weevil eradication project. Cotton growers have reduced the number of annual insecticide applications from 15 to 5 since 1983. This represents a reduction of at least 140,000 lbs. of insecticides per year for the industry. IPM practices used by peach growers include extended preharvest interval and elimination of certain pesticides on peaches destined for baby food, reduction or elimination of blossom sprays based on weather condition, and extended interval for sprays for scab control.

Pesticide Applicator Training

The primary goal of this educational program is the training, certification and recertification of all sellers and users of restricted-use pesticides in South Carolina.

Since our recertification program began in 1979, more than 10,000 applicators have received more than 25,000 certification hours.

Data on the number of dealers, applicators participating in certification or registration programs were collected.

Extension sponsored 65 training events, schools, courses and workshops at which nearly 6,000 participants received pesticide training.

Pesticide Impact Assessment

The S.C. Pesticide Impact Assessment Program carries out pesticide use surveys for farm commodities and responds to information requests from the National Agricultural Pesticide Impact Assessment Program related to EPA regulatory actions on pesticides.

Last year the program began pesticide use surveys or continued studies under way on peanuts, watermelons, peaches, greens, Christmas trees, cucumbers, tomatoes, sweet potatoes, turf, wheat and apples. To date, surveys on peanuts, watermelons and peaches have been completed.

The program conducted a pre-assessment and full use assessment on methyl bromide, a fumigant used widely in South Carolina.

Risk Management/Natural Disasters

Extension presentations were made in conjunction with National Weather Service meteorologists to the State Disaster Preparedness Workshop held in Columbia.

At the Agricultural Education workshop, Ag. in the Classroom was used to present training on radiation (light) measurement and use in the classroom for K-5 classroom teachers.

Routine climatic summaries are prepared each week for dissemination to the USDA/NWS Weekly Weather and Crop Report. Evaporation forecasts and climate summaries are prepared weekly through the growing season to help tomato growers plan irrigation and chemigation.

Small Farms

Last year 140 small-scale farmers completed an Extension program in agricultural leadership development. Extension has provided small farm training in leadership skills for cooperative boards, associations and commissions.

More than 1,500 farmers took part in specific small-scale farm educational programs. During the year the Simplified Farm Record system for small farms was improved and expanded with the help of a USDA grant. About 500 small farmers participated in tours and demonstrations of production and management practices on local farms and in area tours.

Soils

Late last year the Ag. Service Laboratory at Clemson bought new state-of-the-art equipment. At the same time Extension began charging for "standard" soil tests. As a result of the new fee for soil testing, the sample load has dropped approximately in half. This is consistent with what happened in other states when they began charging.

To expedite the recovery of soil tests to normal (about 60,000 a year), a plan has been prepared to market the benefits and importance of all aspects of the soil testing program and other laboratory services.

An Extension specialist enlisted the help of 15 farmers from Saluda, Lee, Sumter, Clarendon and Aiken counties in an animal waste testing project.

Natural Resources and Environment

Beneficial and Harmful Insects and Fungi

The Termite Technician Training Facility at the Sandhill Research and Education Center near Columbia has proved to be a very significant Extension project. This facility improves the technical abilities of those persons actually applying pesticides to control termites in S.C. buildings. Millions of dollars are spent each year on the prevention of termite damage and on repair of termite damage.

The termite technician training facility includes a structure with examples of all types of ground level construction, from slab to crawl space. This is used to train termite technicians. In the two years since the facility was completed, more than 300 technicians have been trained there. The program has drawn the attention of the National Pest Control Operators Association and has become a model for several other states.

Forest Resources

To date, Extension has reported direct involvement in reforestation or rehabilitating 180,085 acres damaged by Hurricane Hugo. A total of 285 foresters have been trained in the management of damaged lands. Landowners have reported saving \$79,200 in their reforestation work.

A demonstration Stewardship Forest is being developed at Camp Harry Daniels to educate private landowners about the benefits of multiple resource management. A combination of formal workshops and other professional meetings have provided training in urban and community forestry to 1,332 professionals.

Extension Forest Resources has expanded its continuing education program this year. A total of 18 formal workshops and seminars were conducted, with 771 foresters and other natural resources professionals receiving training.

A new youth education program was developed jointly by Extension Forest Resources and 4-H and Youth Development. "Teaching Kids About the Environment" is a three-day camp program offered to students in middle schools. Topics covered include forest, water, wildlife and land resources.

Marine Extension Program

Extension has delivered educational programs to promote sustainability of coastal natural resources. A xeriscape training program was conducted by Extension staff for the greens industry and homeowners on Hilton Head Island. As a result, Hilton Head is working with Extension on laying out a new office site that will incorporate xeriscape principles.

A marine camp was conducted by Extension this year with 400 youth attending and receiving information on environmental education and water quality. Another coastal Extension project focuses on how new materials can be used in commercial shrimp nets to reduce fuel use.

A venture funded by EPA and conducted by Extension and the S.C. Department of Health and Environmental Control, seeks to identify sources of non-point pollution in Charleston Harbor and to provide information on how to reduce such pollution.

Wildlife

Many farmers report losses in a number of crops due to deer depredation. In some cases the losses have been severe. Efforts to address these problems include: (a) determining the extent and statewide economic impact of crop damage by deer, (b) developing information delivery systems to provide alternatives for farmers to reduce crop depredation, (c) identifying information needs to deal with deer problems.

To determine the extent and impact of deer damage to crops, a \$10,000 grant was obtained from the S.C. Wildlife and Marine Resources Department for a statewide survey of farmers. Tests of "deer resistant" soybean varieties were conducted. Variety testing demonstrations were developed in Colleton and Hampton counties for soybean producers. This year, efforts began to develop a 10,000 acre demonstration and research site to illustrate a community approach in reducing deer numbers and crop damage.

Commercial Development Programs

Funding from the \$1.1 million grant provided by the W.K. Kellogg Foundation ended on May 31, 1992. The grant, originally designed to help operate the Palmetto Leadership program for three years, was extended 12 months. Currently Extension and eight county governments are funding local coordinators community development positions. The counties are Barnwell, Chester, Darlington, Greenwood, Hampton, Jasper, Marion and Pickens. The 14 counties receiving private or public operating funds for local community development services from local sources are Barnwell, Chester, Chesterfield, Darlington, Dorchester, Edgefield, Greenwood, Hampton, Jasper, Kershaw, Marion, McCormick, Pickens and Saluda counties.

Community Leadership Development

The objective is that community and county leaders will increase skills and knowledge of leadership, communication, conflict management, decision-making and group facilitation.

This year the community leadership development program known as Palmetto Leadership expanded to 17 counties. The total number of program participants was 1,059 with 990 graduating.

The leaders received instruction on a variety of personal subjects and on management skills, such as group decision-making, facilitation and task force management. The third area of instruction dealt with the fundamentals of community development, public policy formation, environmental scanning, needs assessment, strategic planning and social action process.

Economic Development

Through this program, county leaders increased their knowledge of the social, political and economic forces affecting rural economic development. They received information through seminars, interactions and printed materials. Following are selected highlights of economic development activities:

Dillon: Industrial Development — The task force cooperated with local officials and the State Development Board to attract a key poultry processing industry to the county.

Hampton: Economic — The Economic Task Force supported efforts to have a medium-security federal prison locate in the county. The impact on the community and county will be significant. The entire complex will house 150-250 minimum security and 750-850 medium security inmates. It will employ 275 staff and have an annual operating budget of \$10-12 million.

Pickens: Tourism — A Tourism Task Force proposal to build a welcome center on scenic S.C. Hwy. 11 has been sent to the state. The center would provide tourist information and promote tourism and economic development in the area. The project is expected to become a model.

Local Government and Services

The Palmetto Leadership program is the primary Extension vehicle through which educational and technical resources are being provided to local officials as well as community leaders. The program, now in 16 of South Carolina's 34 predominantly rural counties, prepares local leaders to address high priority community problems through the creation of task forces.

Other services provided to local governments include publication of the newsletter, *Issues in Community and Economic Development* which provides information on timely issues relevant to economic development. Extension co-sponsors the Community and Economic Development Program.

Extension is a member of the S.C. Rural Development Council. A project is being developed to demonstrate the effectiveness of the council in accomplishing economic development through coordination of governmental and private resources.

Quality of Life

This program helps local leaders learn about local issues and public policies on such matters as solid waste management, recycling, improved educational achievement, tourism, recreation, housing, health care and safety. Among topics addressed were:

Chester: 911 Research — This group conducted a feasibility study of installing the 911 system in the county. Sites have been examined, cost estimates have been established, and public presentations have been made.

Ware Shoals: Community Aesthetics — This task force is involved in planning for the continuation of the Main Street program.

Edgefield: Education — This task force is studying ideas regarding how to reduce the school dropout rate in the county.

Edgefield: Leisure — The task force has been working with the Arts Council to promote cultural events for the county. A committee is working on the development of the city museum.

Hampton: Medical — The Medical Task Force continues working on the teen pregnancy problem. A Teen Life Center was established and has a director.

Jasper: Recreation — The 10-member task force recommended creation of a countywide recreation program. The program was funded by the county for \$37,000.

Marion: Solid Waste Management — Worked with county council on solutions to current waste management concerns. Review proposals from private waste management companies.

Marion: Quality of Life (Housing) — With 30 percent of Marion's residents living in substandard housing, the Housing Task Force is working to establish a Habitat for Humanity affiliate in the county.

Pickens: Health Care — The Health Care Task Force has been working with the Pickens County Free Medical Clinic to secure additional facilities, supplies and support. This group also has worked with the American Cancer Society on the Best Chance Network — a screening process for women.

In addition, homework centers were started by Pickens County by the Palmetto Leadership Education Task Force supported by Visions for Youth. Similar programs have been started (or will begin soon) in Abbeville, Greenwood, Hampton and Oconee counties.

Family Development, Resource Management

Food Quality, Safety, Nutrition and Health

Food borne diseases cost America \$5.5 billion per year. Consumer confidence in the safety of the food supply tends to rise and fall as media covers issues. The food quality team responded to 11 food issues by providing information to counties, in most cases, before the issue broke. Seafood safety, BST, food irradiation, low fat ground beef, MSG and Salmonella in cantaloupe were among food issues which made news during the year. As each issue surfaced, an expert team was named, information was sent electronically to counties, and media articles and interviews were released as appropriate.

A workshop for the media covering food quality and safety issues drew 60 participants. The team sponsored the live videoconference, "Agriculture, Health and Risk: Balancing the Issues," which aired in 18 sites. More than 5,000 people took part in Extension food handling education programs. Across the state, 1,804 people were involved in other Extension food quality, safety, nutrition and health education efforts.

Youth Development

Major emphasis was placed on developing coalitions with other public and private agencies, institutions, industries and units that serve youth. These coalitions have provided a basis for exploring the present youth situations and developing and implementing community-based programs targeted at needs of youth. These programs include drug and alcohol prevention, development of self-esteem, specific skill development, after-school homework centers, specially designed "teen centers," and special-interest camps for youth with unique physical and/or social needs.

Last year, nearly 60,000 youth and 4,000 volunteers were involved in this effort. Following are brief descriptions of programs in each area:

Animal and Poultry Science

Animal and poultry programs are offered primarily through project clubs and school enrichment programs and statewide events. More than 8,000 youth participated in school enrichment programs in animals and poultry. New programs introduced this year included: Avian Bowl, Dairy Bowl and Hippology Competition (horse knowledge). The sheep/lamb project also is new. It has grown from 66 4-H'ers in 1988 to 232 in 1991. The dairy, horse and poultry projects remain strong.

Citizenship and Community Involvement

All 46 counties received tapes, film strips and scripts to promote citizenship awareness. Five youth from Saluda County attended Citizenship/Washington Focus in Washington. Community involvement included special teen-action prevention teams for substance abuse and a special week-long conference for African-American males at the Long 4-H Leadership Center. The purpose of the conference was to focus the participants on community and personal pride through role models and special training.

Communication, Arts and Leisure

Statewide workshops and seminars were conducted. The agenda included music (vocal and instrumental), dance (modern, jazz, tap), art (poster, cartoon), and drama (monologue, skits). The highlight of this program was the selection of Kershaw County 4-H'er Reggie Jackson to perform at the Democratic National Convention in New York City.

Cultural and International Education

More than 827 persons participated in this area, gaining cultural and international understanding through day camp experiences and classroom presentations. An instructional video was developed for staff development and a comparative study of family support systems in Israel is in progress. Alumni involvement is maintained through an annual reunion and through county-based alumni recognition.

Economics, Jobs and Careers

Nearly 1,800 youth received economics information through various workshops, seminars, orientations and exhibits at 4-H camps, schools, State 4-H Congress and local 4-H club meetings. The program focused on understanding career choices, skills in career decision-making, challenges in the future work environment, how to get a job, health care and job interviewing.

Food and Nutrition

4-H'ers participated in a national workshop on the Global Food Web. They did a "learnshop" on the topic at the State 4-H Teen Leadership Conference.

Health

Extension 4-H health educational programs in schools and community clubs on topics related to personal development, social development and the environment were reported by 13 counties involving 1,857 youth and adults. 4-H participated in the state educational alliance effort to reduce tobacco use by youths.

Individual and Family Resources

More than 200 young people participated in the S.C. Consumer Judging Contest. They learned how to make wise decisions in the marketplace and the basic steps in decision-making. About 70 volunteer leaders received clothing training. Through grant funds, seven county programs received financial assistance for community clothing clubs.

Life Skills

This year 2,500 4-H'ers planned, led and/or participated in life skills programs. Many of these were conducted by 4-H youth leaders for high-risk youth in their communities. Programs emphasized understanding and acceptance of self, communication, decision-making and interpersonal relationships.

Mechanical Science and Safety

More than 1,000 youth participated in 4-H engineering science and safety programs. A new program for 9th graders — the 4-H Energy Challenge — began in partnership with Duke Power, S.C. Electric & Gas, and Carolina Power & Light

Companies. This past year, 39 counties competed in an energy-focused quiz bowl with cash awards in excess of \$5,000. The cash awards enable science classes to buy equipment. Others participated in statewide AMP camps.

South Carolina has received a \$5,000 grant for a 4-H safety program to promote all-terrain vehicle (ATV) safety. ATV safety programs have been conducted at 4-H camps, and a statewide ATV program committee is being organized.

Natural Resources

The Coalition for Natural Resource Education was organized and began to develop and implement environmental curricula and programs. The first effort of the coalition was to develop and implement an outdoor education program that would expand the classroom for students in South Carolina. "Teaching KATE" (Kids About the Environment) was piloted in April and May 1992 with 613 students and teachers participating. Each student received 12 hours of learning experience in four areas: forestry, wildlife, soils and water. KATE was expanded into a nine-month program in the fall of 1992. Anticipated participation for this school year is 5,200 students.

Science and Technology

The S.C. 4-H program is working to develop a new science and technology curriculum. Projects are being developed in cooperation with new partners to address newer, more dynamic science and math curricula. "4-H Missions in Space" is the newest project. It provides an opportunity for youth to attend a space camp at the U.S. Space and Rocket Center in Huntsville, Alabama.

McCormick County received a national grant of \$60,000 to help young people develop scientific skills. More than 300 youth participated in science programs and S.C. young people were offered programs that supported their interest in science.

Volunteerism and Leadership

The S.C. 4-H Volunteer Leaders Association developed the educational program for last year's Southern Region Leader Forum that was attended by more than 500 volunteers from 13 states, Puerto Rico and the Virgin Islands. Volunteers are planning now to host this year's forum in South Carolina.

The Clemson University 4-H Collegiate Club received \$1,000 in grants from National 4-H Council to help develop community service in the state.

Youth Program Management

To help with county 4-H programs, several steps were taken during the past year. The most important of these was the 4-H desktop management system. This consists of notebooks on events and activities, curriculum and volunteer systems management. The notebooks contain rules, regulations and entry forms for major 4-H events and activities during the year, information on program management, awards, use of the 4-H name and emblem and tax exempt status for the 4-H program.

Youth At Risk

Team members took part in a comprehensive team building exercise in 1991. This training prepared them to conduct a state training in collaboration building for youth professionals early this year. These efforts have resulted in 17 counties reporting more than 1,500 persons in collaborative efforts at the county level. Additionally, 1,471 non-Extension providers received youth at risk training from Extension.

Almost 13,000 high-risk youth have participated in specially designed programs, and more than 300 parents/guardians have been reached. Within the past year, McCormick County received a \$60,000 grant for youth at risk programs. This grant will be used to help at-risk youth increase their academic standing and social responsibility skills in an in-school counseling program.

Family Development and Resource Management

Family Life and Human Development

According to the Office of Vital Statistics, 5,435 S.C. girls age 14 to 17 became pregnant during 1990. Clemson Extension provides leadership to Teen Pregnancy Prevention Councils in the state. Through collaboration with other groups, programs are implemented to raise awareness and educate youth and adults. These focus on building self-esteem, coping with peer pressure, communication skills and making responsible decisions.

During 1991-92 the Children and Adult Resource Express (CARE) information and referral system expanded, providing information on the availability of dependent care for the young and elderly local communities. CARE was accessed 36,527 times during the year.

The Parenting Renewal program continues to be widely used. This year about 10,000 families received parenting information.

Housing Issues

During 1991-92 Extension home economists worked with other federal, state, county and local agencies on a state plan for educational programs on housing. A number of federal, state and local agencies and lending institutions have agreed to work together on educational programs for homeowners.

One goal is to help more people learn financial management and good credit use practices to qualify for home loans and to keep payments current once they are in the home. Another goal is to teach potential homeowners to budget for the full cost of home ownership. Two publications were developed for this project.

A third year of funding was secured for radon gas air quality contaminant education, research and demonstration work. Extension agents in 26 counties made more than 3,000 client contacts on air quality, moisture and other housing issues.

Family Resource Management

This year has been a planning and piloting year for new programs on wills/estate planning, coping with unemployment and economics of divorce. Reports from 21 counties indicate 636 students took part in the "Go For The Goal" career program; 687 clients received information on wills and estate planning; 315 received information related to job hunting; 142 got information on coping with unemployment; and 226 limited resource persons had instruction in resource management.

The clothing and textiles management program presented information to about 2,000 persons. More than 310 volunteers were involved in teaching and training youth on clothing and textiles, an increase of 20 percent last year.

The S.C. Textiles and Clothing Entrepreneurship Project has been the focus for home-based business efforts. More than 330 persons applied for 80 openings in a week-long intensive business training which taught home sewers how to turn their skills into a business. Industry donations for this project totaled \$77,600. Forty percent of the participants now are sewing for pay.

Food, Nutrition and Health

South Carolina's morbidity and mortality statistics are dismal. Life expectancy is among the lowest in the country and deaths from health disease, cancer and stroke exceed the national average. Work in these areas included dietary guidance, food procurement and preparation, and the Expanded Food and Nutrition Education Program.

Accomplishments include: 6,661 programs presented on making healthy food choices, 2,652 people are using Extension dietary guidelines to improve their health, 789 persons took part in the Diet Puzzle weight control program, 3,966 programs were given information on food preparation, and 2,656 were presented on food procurement.

About 4,000 S.C. homemakers enrolled in the adult phase of the Expanded food and Nutrition Education Program. The youth EFNEP program operated in 32 counties with 5,000 enrolled.

Volunteer Leadership Development, Related Areas

Data on leadership and public policy indicates a total of 5,508 contacts this past year. Reports indicate that almost 2,000 clients participated in the Family Community Leadership (FCL) training. These trained volunteers, in turn, train others with more than 300 volunteers having conducted FCL training and workshops. Nine counties received mini grants this year to conduct leadership training.

The S.C. Extension Homemakers Council, now named the S.C. Association of Family and Community Education, has been an especially effective volunteer group. Their current focus is on family issues (children), the environment (waste management) and global issues emphasizing literacy. Nearly 29,000 contacts were made statewide. back fat average of .63 inches. Genetic improvement continues and provides important data on herd sire performance for the state's commercial hog producers.

DIVISION OF REGULATORY AND PUBLIC SERVICE PROGRAMS

The Division of Regulatory and Public Service Programs, formed in 1970, comprises the director's office and four departments: Fertilizer and Pesticide Control, Plant Industry, Seed Certification and a portion of Agricultural Chemical Services.

The division's mission is to enhance the quality of life, agriculture, environment and dwelling for South Carolinians by ensuring compliance of regulated industries and individuals with federal and state legislative mandates.

Our programs promote the use of certified seed and plants; provide the services needed for certification of crop plants; assure that fertilizers, lime, pesticides and seed meet the standards to produce marketable, safe and profitable crops; provide inspections to monitor pesticide treatments by pesticide applicators; regulate the structural pest control industry; and monitor anti-syphon devices on farm/nursery/turf irrigation systems that supply pesticides and/or fertilizers along with water.

We also provide inspections to assist the state's plant industry in certifying plant material and agricultural commodities to be apparently pest free; maintain the honey-bee health of the state through eradication, quarantines, regulatory treatments and permitting; eradicate noxious plant pests such as the cotton boll weevil and the parasitic witchweed from the state; and ensure that abandoned fruit orchards do not become a menace to nearby producing orchards.

The following activities, by department, highlight the division's work for 1991-92.

Fertilizer and Pesticide Control

The Department of Fertilizer and Pesticide Control is responsible for education and enforcement of a number of laws and regulations. The S.C. Fertilizer Law and the Liming Materials Act are designed primarily to ensure that consumers receive high quality fertilizer and lime. The Pesticide Act regulates pesticide storage, sale and use plus such areas as quality of manufacturers production and all aspects of pesticide and structural pest control.

Some of the major activities of this department relative to fertilizer and lime from July 1, 1991 to June 30, 1992 follow:

Fertilizer tons sold.....	536,679
Fertilizer samples procured & analyzed.....	3,882
Fertilizer samples not meeting guarantee.....	451
Lime material & samples procured & analyzed.....	209
Total number of liming material samples not meeting guarantee.....	14
Percent of liming material samples deficient.....	6.7
Fertilizer penalties collected, payable to state treasurer**.....	21,302.00
(Deficiencies where consumers not identifiable)	
Lime penalties collected, payable to state treasurer**.....	490.00
(Deficiencies where consumers not identifiable)	
Fertilizer registration fees collected, payable to state treasurer**.....	29,630.00
Lime registration fees collected, payable to state treasurer**.....	690.00
Lime permit fees collected, payable to state treasurer**.....	1,670.00
Fertilizer taxes sent to state treasurer**.....	136,278.89
Soil amendment registration fees.....	200.00
Soil amendment inspection fees.....	3,824.70

** Actually recorded by state treasurer July 1, 1991-June 30, 1992, but may not correspond to final fees paid for the fiscal year.

The fertilizer tonnage sold this year rose 5.6 percent from 1990-91. Overall 11.6 percent of fertilizer samples did not meet the guarantees within the investigational allowances. This is the lowest deficiency rate in the history of this program. This deficiency rate fell from 1990-91. Other than deficiencies, the greatest problem in the fertilizer and lime areas still is the lack of proper labeling of bulk material.

The S.C. Pesticide Control Act mandates quality control monitoring and regulates the sale, use and application of all pesticides used in South Carolina. This department employs a strong preventive violation/education program coupled with fair enforcement actions to help ensure productivity while preventing adverse effects on man or the environment.

To improve its education and enforcement capabilities, the department pursued external funding without decreasing the flexibility of the pesticide program. These efforts resulted in a \$536,440 grant from EPA. The department also made a concerted effort to increase efficiency by using state-of-the-art data management. During 1992 new legislation revised pesticide registration fees and allowed the department to keep all registration fees exceeding \$140,000 and PCO license fees to \$50,000. All other fees go to the state treasurer.

In 1991, 900 companies registered 9,318 pesticide products for sale in South Carolina. The department collected and analyzed 795 pesticide samples. Inspectors found five deficient in the guaranteed percentage of one or more ingredients and issued stop-sale notices. The department collected \$144,744 in registration fees.

Using provisions of the Federal Pesticide Control Act, the department issued five Section 24 (C) special local need registrations. The EPA granted three Section 18 emergency exemptions solicited by the department.

Pesticide dealers and applicators must be certified and licensed to buy, sell or apply pesticides classified for restricted use. Last year, the department issued 11,550 private applicator licenses, 2,236 commercial applicator licenses, 762 non-commercial licenses and 316 pesticide dealer licenses. Certification fees collected totaled \$58,407. Business license fees totaled \$50,455 for 673 business companies.

In the area of education and enforcement, the department's specialists made frequent contact with pesticide users, including dealers, growers, applicators and consumers. The structural pest control area requires particular attention. The Pesticide Act was amended to increase the insurance/bond requirement to become licensed as a commercial applicator.

Enforcement actions against violators were decisive but fair. As part of the EPA/Department of Fertilizer and Pesticide Control Cooperative Enforcement Grant, the department made 96 marketplace inspections, 360 certified applicator record checks and 315 restricted-use pesticide dealer inspections.

The department levied 42 civil penalties ranging from \$100 to \$1,000 and totaling \$29,950. Investigators pursued 975 cases of potential pesticide misuse, complaint or noncompliance with regulations. They issued numerous stop-sale notices for unregistered products, sale of restricted products by unlicensed dealers and other alleged violations. The department issued warning letters in 200 cases. Overall compliance with the act by members of the agribusiness industry has been excellent.

Department of Plant Industry

The mission of the department is to prevent the introduction and spread of plant and honey bee pests into, within, and from South Carolina through plant pest exclusion, quarantines and eradications; plant export certification; honey bee pest exclusion; nursery, greenhouse and transplant certification; boll weevil eradication and elimination of abandoned orchards. This mission is directed by a number of laws and regulations.

Activities this year included:

Nursery Inspections: By provisions of the Crop Pest Act, Plant Industry licensed 647 nurseries, greenhouses and vegetable transplant growers and 1,036 nursery dealers to sell plant material. Plant Industry specialists visited an additional 659 establishments to determine compliance with quarantines and plant pest regulations. Fifty-two other nurseries failed seasonal inspections due to pests, weeds or other problems. Specialists issued two Stop-Sale/Seizure orders for plants considered public nuisances. Plant Industry processed 79,725 permit tags for nursery stock movement.

Phytosanitary Certification: Plant Industry issued 306 state and 11 federal Phytosanitary Certificates for exported plant material. The certificates covered orchids, rose plants, chrysanthemum and poinsettia liners, seed, propagated native plants, anthuriums, and peaches. The plant material was shipped to other states or U.S. possessions and 23 foreign countries.

Special Inspections: Plant Industry specialists processed 19 plant inspection certificates for homeowners moving house plants to other states. The department provides this public service when the receiving state requires house plant inspection. People relocating to Florida accounted for 42 percent of these requests. Pee Dee tobacco transplant growers requested special inspections allowing sale of 4,039,000 transplants to North Carolina growers.

Phony Peach Disease: Two temporary inspectors and three Plant Industry specialists surveyed peach orchards in the S.C. Ridge and Coastal Plains for phony peach disease. Disease incidence in 1991 was 152 trees out of 1,428,730 inspected, or .01 percent.

Sweet Potato Inspection: Specialists made 23 pest detection inspections for eight growers in the Pee Dee, Sandhill and Coastal Plains regions. Scurf disease rendered one small lot of seed potatoes unsuitable for planting.

Introduction of Honey Bees Into State Act: The state apiary program included inspection of 67 apiaries, representing 1,363 colonies of bees. Pest problems included Nosema disease in one colony, American foulbrood in two colonies, and European foulbrood in two colonies. Tracheal mites continued to play a major role

in colony losses in the state. During the year, specialists confirmed Varroa mites in state resident honey bees in 16 counties. Africanized honey bees were not detected in the state this year. The department, however, placed honey bee swarm traps at high risk inland locations in the state to monitor swarm identity. The swarm traps supplement swarm monitoring by the USDA at the Charleston, North Charleston, Beaufort and Georgetown ports. All 28 swarms captured so far this year were European honey bees.

Neglected or Abandoned Orchards Act: Abandoned fruit orchards generally cause a build-up of orchard pests that affect other fruit growers in the area. Under the act, Plant Industry specialists performed investigations of abandoned orchard complaints. Department efforts led to removal of 80 acres of nuisance peach trees by three property owners.

Cooperative State/Federal Programs: Plant Industry and the USDA renewed a cooperative agreement in 1991. The agreement created temporary survey and control activity jobs in the witchweed and gypsy moth programs for about 75 people.

Only 9,476 witchweed-infested acres in four counties remain in the state. This year the program released 1,710 acres from quarantine but found 326 new infested acres. Contractors treated 8,000 acres this season. Since the program's beginning, eradication efforts have led to the release of 71,649 (87 percent) net acres from quarantine.

Surveyors installed 4,335 gypsy moth survey traps at priority sites or in selected grids in 42 counties of the state in 1991. A total of 107 traps caught 155 adult male moths during the season. Horry County trapped 91 male moths. No other county caught more than 12 male moths.

The boll weevil eradication area in 1992 covers the whole state, but only six boll weevils have been caught as of August. In 1991, part of the state was still in the buffer zone (now called active program area). The old buffer zone area reported 872 boll weevils and the eradication area zero boll weevils in 1991. Cotton growers expressed satisfaction with the program results. South Carolina had 209,747 acres of cotton in 1991. About 980 growers paid fees of \$1,160,784. A General Assembly appropriation of \$193,334 reduced acreage fees paid by cotton growers in 1991. The \$5.50 an acre rate in 1991 dropped to \$4 per acre in 1992.

Officials have found the imported fire ant in all S.C. counties. Generally infested counties or portions of counties are under quarantine. The department cooperated with the USDA to assist nurseries, turf growers and other establishments in the quarantined area to meet plant shipment quarantine requirements. Specialists initiated compliance agreements with all regulated nursery establishments that sell nursery stock outside the quarantine. Specialists supervised regulatory treatments required by the quarantine.

Seed Certification

Seed Certification is a program of standards imposed on the seed and plant production industries that ensures varietal purity, good germination and freedom from noxious weed seeds. Participation in the program is voluntary.

In 1945 the General Assembly designated Clemson as the agency to inaugurate and carry out a program of certification of pure seed and plants in South Carolina.

Department field work in 1991-92 involved inspections of 29,656 acres of crops for certified seed production. Inspections included 73 varieties of 13 crops for 151 farmer/growers and 25 seed-producing firms. Inspectors checked each field to determine that the crop was true to variety and free of noxious weeds and seed-borne diseases.

Acreages of major crops inspected were: soybeans, 17,688; small grains, 10,275; cotton, 457; peanuts, 576; grasses, 401; and pine trees, 213. Other field work involved grow-out plantings of 380 samples representing 190 lots of S.C. certified soybean and small grain seed to verify proper sampling and labeling.

During 1991-92 the department issued 749,781 certified tags to growers whose seed met standards in the field and laboratory. Personnel inspected and approved 25 facilities during the year for custom conditioning of S.C. certified seed.

Agriculture Chemical Services

This department performs the chemical analyses reported by the Department of Fertilizer and Pesticide Control. Most samples in 1991-92 were multi-component. We made more than 20,000 individual analyses.

The laboratory has concentrated on improved methodology, instrumentation and organization to analyze all samples quickly and accurately. The department performed more than 30,000 analyses for the S.C. Agricultural Experiment Station during the fiscal year. In addition the Agricultural Service Laboratory processed more than 32,000 soil samples, 5,200 plant and feed samples and 4,500 samples for nematodes.

LIVESTOCK AND POULTRY HEALTH DIVISION

The Livestock-Poultry Health Division conducts a number of regulatory programs in consumer protection, animal health and the diagnosis of various diseases in S.C. livestock.

The division's three main responsibilities are the administration of the Livestock Health Programs, the Animal Diagnostic Laboratory and the S.C. Meat and Poultry Inspection Programs.

Livestock Health Programs

The Livestock and Poultry Health Programs protect animal health through support to producers and veterinarians and the enforcement of animal health laws in our state.

Faced with numerous zoonotic diseases (those common to man and animal) this organization plays a major public health role.

South Carolina is free of brucellosis in cattle (undulant fever in man) and tuberculosis in cattle (contagious to man) due to extensive regulatory programs of this office.

We eliminated hog cholera, the major swine disease, from South Carolina in the 1970s. A major outbreak of Eastern equine encephalitis, which caused three human deaths in our state in the last three years, occurred in 1991-92. We had 55 laboratory positives and many other clinical diagnoses. We currently administer the successful pseudorabies and equine infectious anemia laws, while adjoining states have major problems with the control of these diseases.

Livestock-Poultry regulates all livestock sales and the interstate movement of animals.

Animal Diagnostic Laboratory

The laboratory assists veterinarians, animal owners or producers, and regulatory agencies with disease diagnostic problems. The laboratory uses disciplines such as postmortem examinations, histopathology, bacteriology, virology and serology to gather information for clients.

The laboratory is involved in the diagnosis of diseases of public health significance such as chlamydiosis, mosquito borne encephalitis and rabies. In cooperation with the National Poultry Improvement Plan, the laboratory monitors egg-type chicken breeder operations for salmonella enteritidis.

During the past fiscal year, the laboratory performed more than 22,000 tests for equine infectious anemia and more than 1,700 bacterial cultures. Pathologists necropsied approximately 1,000 mammals and 1,900 fowl during this time. Histopathologic examination was performed on approximately 2,000 of the necropsy cases and 2,000 mail-in cases.

As our case load continues to grow and demands for diagnostic services broaden, it will be imperative for the laboratory to use modern science-based technologies to meet the needs of our clients.

Meat and Poultry Inspection

The S.C. Meat and Poultry Inspection Department serves as a public health regulatory agency which is responsible for ensuring that inspected meat and poultry products are safe, wholesome and accurately labeled.

The department recently implemented a microbiological monitoring program for the presence of salmonella, listeria and campylobacter organisms in cooked meat products. The Animal Diagnostic Laboratory has developed the capability for conducting these tests to support the meat inspection program.

For several years, we have maintained an active monitoring and surveillance program for chemical residues in tissues of food animals. This program involves in-plant testing for the presence of antibiotics and sulfonamide residues, submission of tissues for laboratory examination and on-farm investigations of all identified violators. These on-farm investigations primarily are used as public health education to assist the producer in identifying the problem and preventing any recurring problems. The number of violations found in the state continues to decline. In the past three years, we have encountered no repeat violators.

The use of traditional organoleptic inspection procedures together with these bacteriological, chemical and histopathological monitoring techniques results in a more balanced meat-poultry inspection program.

We currently are inspecting 101 red meat plants and nine poultry plants.

COLLEGE OF FOREST AND RECREATION RESOURCES

Founded in 1970, the College of Forest and Recreation Resources is responsible for promoting the wise management, use and stewardship of the natural resources of the state, region and nation. Under this mandate, the college continues to meet the needs of South Carolina through aggressive education, research and extension programs aimed at managing the state's assets and enhancing the quality of life for South Carolina citizens through the wise use of leisure and the creation of pleasing living environments. The importance of this college's function comes under sharp focus when it is noted that the college is the center of expertise for two major industrial groups in South Carolina. Together, the forest, recreation and tourism industries contribute in excess of \$10 billion annually to the state's economy.

It also should be noted that on March 8, 1988, the Department of Aquaculture, Fisheries and Wildlife became a third department in the college. It is jointly administered by the deans in the Division of Agriculture and Natural Resources in which Forest and Recreation Resources is housed. The annual report for the Department of Aquaculture, Fisheries and Wildlife will be listed under the teaching, research and Cooperative Extension Service sections of Agricultural Sciences.

Research and extension activities in forest management, wood utilization, recreation, tourism and service programs to special populations are carried by the Department of Forest Resources and the Department of Parks, Recreation and Tourism Management. Both programs offer educational programs from the baccalaureate through the doctorate degree. College programs also have utilized Clemson's expanded statewide interactive video network for expanding educational opportunities. In addition to traditional departmental structures, the college operates two research institutes: Regional Development Group and Archbold Tropical Research Center. The Regional Development Group (RDG) focuses on issues dealing with natural resource allocation, nature-based tourism and community development throughout the state and region. The Archbold Tropical Research Center (ATRC) is the locus of a consortium of universities and agencies examining issues and problems associated with tropical ecosystems. ATRC also manages the Clemson Research Facility — Springfield Plantation — located on the island of Dominica.

The college has begun an effort to develop centralized interdisciplinary research facilities. The first program in this effort has been the creation of a state-of-the-art facility which utilizes the Geographic Information System (GIS) based upon a Sun 4330 platform with additional work stations and support peripherals. The facility has been instrumental in opening new research opportunities and has stimulated new graduate student educational opportunities.

Department of Forest Resources

Forests and forest industry are a large part of South Carolina. Sixty-four percent (12.2 million acres) of the state is commercial forest land and forest industry is South Carolina's third largest manufacturing industry, followed only by chemicals and textiles. The annual value of all forest products industry shipments is about \$5 billion.

The Department of Forest Resources is an integral part of the University's land-grant mission. The department's goal is to provide the citizens of South Carolina, the nation and the world:

- Undergraduate and graduate educational programs that (1) produce forest management and forest products specialists of the highest professional competence and integrity, and (2) expose non-majors to the understanding, wise use and management of the forest and its products.
- Forestry and forest products research programs that furnish the scientific expertise and leadership required for technical advancement and wise management and utilization of the forest resources.
- Direction and technical guidance by presenting existing knowledge and new research results in a usable form to forest landowners, the public, resource professionals, wood products firms and conservation-oriented organizations.

The Department of Forest Resources' programs in education, research and extension are unique within the state of South Carolina. The department plays an important role in educating new and practicing forest resource managers. During the past academic year 20 bachelor of science, 11 master's and four Ph.D. degrees were awarded. In addition, the department's Forestry Continuing Education (FORCE) Program had 18 offerings, ranging in length from one day to six weeks, and taught more than 770 different students. Among the offerings was a course teaching practitioners how to use satellite technology to map forest resources.

The department was visited by the Society of American Foresters (SAF) Accreditation Review Team last March. The final results of the review will not be known until October 1992. However, the Review Team's comments were helpful

and stimulating. One result is a new forest resource management curriculum, currently being considered by the faculty, which would meet SAF accreditation and U.S. Civil Service requirements and still would allow the student to minor in any department in the University.

Many faculty were actively engaged in research. Several provided strong leadership in multi-person teams which published results of particular interest and importance to South Carolina. One, titled "A Survey of Voluntary Compliance of Forestry Best Management Practices in South Carolina," provided a baseline for overall and individual compliance to standards required by the Clean Water Act. Among other results, the study found that 84 percent of the logging sites met minimum standards. A second report, "Forestry and South Carolina's Forest Resources: Their Economic Importance," documented the place of forests and forest industry in the state economy. A third, "Forest Landowner Responses to Hurricane Hugo," found that 62 percent of the landowners tried to salvage storm damaged timber but that only 19 percent planned to regenerate their forest.

The department currently is preparing for a Cooperative State Research Service review of its research program in September 1992. Two emphasis areas have been identified: Ecological Forest Management and Forested Wetlands Management and Science. We are developing a similar emphasis area for forest products. We also are preparing to begin our campaign for the Endowment for Forested Wetlands Research and Education. This \$6 million program will capitalize on the department and its Belle W. Baruch Forest Science Institute's expertise in forested wetlands.

The FORCE Program, mentioned above, is only one of our extension activities. Our extension faculty seek cooperative activities with other organizations in addition to their personal activities. The Teaching KATE (Kids About The Environment) Program is an outstanding example. Working with the Coalition for Natural Resource Education, Teaching KATE was inaugurated in April 1992 with 64 students and seven teachers and has been pilot tested with

600 middle school youth. Other cooperative efforts include timber production and multiple-use forestry demonstration areas on Camp Harry David and the Clemson Experimental Forest; a Forest Stewardship Newsletter; an Herbicide Prescription Manual; and a Directory of Certified Forestry Herbicide Applicators.

Department of Parks, Recreation and Tourism Management

Teaching

Teaching personnel in the Department of Parks, Recreation and Tourism Management (PRTM) are dedicated to excellence in education at the bachelor's, master's and doctoral levels. Professional preparation by our students leads to careers in public and private leisure-service agencies including: county and municipal leisure services administration; youth serving agencies; federal, state, and county recreation and park resource management; therapeutic recreation program delivery systems; and, the broad field of travel and tourism management. PRTM-related careers account for a \$400 billion industry nationally and a \$6 billion industry in South Carolina. Furthermore, preparation at the doctoral level is directed toward research and instruction in academic settings.

Fall 1991 enrollment figures for the department are shown below:

Undergraduate	347 students
Travel and Tourism	60 percent
Therapeutic Recreation	15 percent
Resource Management	15 percent
Community Leisure Services	10 percent

Graduate

M.P.R.T.M.
M.S.
Ph.D.

61 students

34 percent
20 percent
46 percent

Highlights within PRTM's instructional program for the 1991-92 year included:

- PRTM participated once again in Telecampus, a unique graduate level, educational outreach program available to practicing professionals throughout South Carolina.
- PRTM held its second Student Assembly in September. The assembly provided an opportunity for Larry Allen, head, to introduce the departmental faculty to all PRTM majors, describe PRTM's mission, introduce practicing professionals, and expose newer students to the student clubs in PRTM.
- PRTM improved its student advising by providing incoming freshmen with a single, full-time adviser. The same has been done for years for transfer students.
- To further assess PRTM's classroom effectiveness, in-class visitations and evaluations again were conducted by the department head.
- To seek fellowship and feedback from approximately 25 undergraduate students at a time, quarterly luncheons with the department head were held.
- The PRTM External Advisory Committee, which comprises six industry leaders, was established to review PRTM's departmental programs.
- Ute Jamrozy, a PRTM graduate student, received the J. Desmond Slattery Marketing Award from the Travel and Tourism Research Association (TTRA). This is one of the most prestigious international awards for graduate students in the Travel and Tourism discipline. This marks the second year in a row that a PRTM graduate student has won this coveted award. Additionally, Ercan Sirakaya, another PRTM graduate student, received special mention in the Boeing Research Award competition also sponsored by TTRA.
- A PRTM undergraduate student, Betsy Cathcart, was successful in winning Clemson University's Algernon Sydney Sullivan Award.

Research

Faculty had another successful year, receiving 37 grants and contracts amounting to \$492,000 in new research and related activities. They continue to pursue research which will bring national visibility to Clemson University and South Carolina. This is especially true for developing guides for marketing plans in South Carolina tourist regions. In addition, data from numerous regional, national and international recreation surveys have been obtained which will allow Clemson to analyze many important leisure-related problems and opportunities. This could lead to recognition of PRTM as a national recreation data depository and analysis center and promises to enhance the research thrust within the department.

Faculty made 20 research presentations at national and regional meetings and 41 other professional presentations to a variety of audiences. Graduate student presentations were encouraged and presentations by these students representing Clemson University also were productive. Faculty and graduate students generated 43 publications with 12 of these appearing in national refereed journals. Faculty repeatedly are requested to serve as referees of research publications and serve on editorial boards of several professional journals.

Public Service/Extension

The department's commitment to education extends beyond involvement with undergraduate and graduate students to include ongoing and other successful programs aimed at a variety of audiences. Some of the public service activities during fiscal year 1991-92 included:

- College Week for Senior Citizens, two, one-week programs, served nearly 360 citizens from South Carolina and the surrounding region.
- Gina McLellan conducted five short courses for the U.S. Forest Service and Herb Stevens coordinated one for the National Park Service. These programs were two and three week programs with several nationally known speakers in addition to PRTM's own faculty.
- Dr. Lorin Toepper has been hired as the director of the Recreation, Travel and Tourism Institute. He is reestablishing a strong network with the tourism industry and is developing several research opportunities with various groups.
- Numerous professional presentations were delivered to organizations at the state, regional and national levels.
- Faculty served on professional boards, editorial boards of national journals and held offices in professional associations.
- The S.C. Rural Recreation Development Project was expanded to seven communities this year including Bamberg, Blacksville, Central, Edgefield, McCormick, Pageland and Ridgeland. The overall project was, in part, made possible by a gift from S.C. Electric & Gas, Inc. in the amount of \$81,000. The program, which provides recreation programs and services via a local recreation director, was extremely successful and served more than 8,000 rural residents this past summer.
- Several PRTM faculty also were honored this past year. For instance, the Ann James Service Award was established by the Southeast Therapeutic Recreation Symposium to honor Ann for her contributions to the field; Jesse Grove received the Outstanding and Distinguished Service Award from the National Wildlife Federation; Wesley Burnett was elected Fellow by the Royal Geographical Society; Charlie White received the Distinguished Service Award from the Southeast Section of the American Camping Association; Gina McLellan received U.S. Forest Service Region 8 Service Award; and Tom Potts received acclaim for his Outstanding Development Program by the National Association for Development Organizations.

Clemson University Outdoor Laboratory

In 1991-92, excluding summer camps, the Clemson University Outdoor Laboratory served nearly 16,000 people from 280 different groups. This service represented 35 more groups and 3,000 more people than the previous year. Our facilities were in use 31 more days than the year before. All statistical records were broken during the 1991-92 year.

The summer camps also were filled to capacity with more than 700 children, teenagers and adults with special needs. More than 50 college students spent the summer at the Outdoor Laboratory. Fourteen of those were from Clemson University. Summer camps included Jaycee Camp Hope (mentally disabled), Camp Sertoma (speech and hearing), Lions Den (visual impairments), Running Brave (hemophilia) and Tiger (muscular dystrophy).

The S.C. Jaycees raised more than \$100,000 dollars in money and materials to support Jaycee Camp Hope and the Outdoor Laboratory. Of that, \$35,000 was used to subsidize the camp according to arranged terms, \$5,000 dollars went to the Rainbow for Hope endowment, and the balance was used for special projects in support of the summer camps.

The Sertoma Board of Directors sponsored a seven session summer program serving more than 260 children. This organization fully funded the program. Additionally, the board voted to establish an endowment at Clemson to support Camp Sertoma and made an initial deposit of \$10,000.

Camp Lions Den once again was financially sponsored by the Mid Day Lions Club of Anderson. Thirty-eight children with visual impairments attended. Camp Running Brave established a record for participation with more than 70 campers

registered. Camp Tiger was held with full funding from the upstate Muscular Dystrophy Association. Throughout the summer, concurrent programs were conducted enabling 16 different sessions to be held during the eight weeks of operation.

In three fall sessions of Senior Adventure Camp, more than 100 persons were served. This program continues to be attractive to the state's elderly and is held at a time when the entire staff can be selected through classes at the University. This program, along with all those above, are conducted to serve the citizens of South Carolina and to give Clemson students opportunities for practical training and experience.

Environmental education continues to provide an excellent avenue for service and student use during the spring months. Five public schools used facilities this past year for educational purposes. Our professional staff planned the curriculum, selected the instructors and managed the program. Again, University students were used extensively. Some University faculty and staff also provided expertise as instructors.

Two facilitator training sessions were conducted during the past year for persons seeking certification in group initiative activities and ropes course management. The Outdoor Adventure Course at the outdoor Laboratory was used by groups and organizations more than ever during the past year.

Campfest, a recruiting day for camp directors from the Southeast, was held in March. More than 40 camps were represented, and about 350 Clemson students stopped by to inquire about summer employment.

Also in March, the Outdoor Laboratory hosted a second year of PUSH Camp (People Understanding the Severely Handicapped). Forty-three members of Pi Kappa Phi fraternity from across the country spent their spring break at the Outdoor Laboratory, building projects to support the summer camp programs. Along with the manpower, the group brought \$7,500 in financial support to underwrite their work.

During the spring, Owens-Corning Fiberglass donated enough shingles to complete the roofing projects planned during the next five years. The value of this gift was \$11,000. With money available through the endowment, several buildings and the central complex were scheduled for new roofs.

Other significant gifts during the year included the following: New boat and motor, new entrance sign, podium for Kresge Hall, new sound system for Kresge Hall, new golf cart, pool and pool deck supplies and materials, infirmary supplies, paper products and camp supplies.

During the past year a new Food Service Manager was recruited to replace a retiring staff member. Jean Webb of Greenville joined the staff in early June.

While records were broken in several areas during the past year, particularly in the volume of use, most facilities continue to show stress from heavy use. The need to provide a major facelift is critical and that need has once again been addressed to the department and college administration. User evaluations are beginning to note the need for renovation and improvement. Without major financial support to complete this work, we could see annual users seeking other locations for their programs.

The Outdoor Laboratory staff worked extremely hard to serve thousands of people during the past year. Our service mission was still strong and our desire to educate students through real experiences was exciting. With groups on the property for 343 days, our responsibilities continued to be spread over every day, every weekend and every week during the year.

Computer Laboratories

The seventh full year of operation for the college's PC Laboratory was successful. As well as instruction for undergraduate and graduate students in the college, personnel from the National Park Service, USDA Forest Service, and Continuing

Engineering Education utilized the Laboratory for computer skill enhancement. Actual use of the IBM Lab during the past year exceeded 15,500 participant hours.

Numerous courses within the college provide students with computer application skills pertaining to the management of today's varied and extensive leisure and forestry industries. Several undergraduate and graduate courses within the college currently offer instruction strictly in computer applications for students.

A full complement of software is available, including word processing, spreadsheets, databases, statistics, graphics, grammar checking, forestry programs and telecommunications. To enhance the ability of students to do statistical analyses in the Lab, the IBM computers also are outfitted with math co-processors. To accommodate those users who prefer 3 1/2 inch diskettes, the Lab has several 3 1/2 inch disk drives.

The former Data General (DG) Computer Training Center, established as a cooperative effort between the college and the USDA Forest Service, merged with the PC Lab during the year. Now, rather than having a stand-alone DG Lab, Forest Service employees and others can use the PC Lab's computers to emulate the DG computers. The center had hosted training programs for Forest Service personnel as well as college faculty and students. The center also supported existing cooperative research and training programs.

In addition, this marks the second full year of operation for the Geographic Information System Research Laboratory. Several exciting projects presently are under way in the GIS Lab. Overall, the College of Forest and Recreation Resources is committed to a leadership role in both the leisure services and forestry fields. The utilization and continual improvement of the PC Laboratory and the GIS Research Laboratory are important means to maintaining this leadership role.

Archbold Tropical Research Center

Clemson University received the donation of the Springfield Plantation from honorary Dr. John Archbold in May 1989. In response to this donation, the Archbold Tropical Research Center was created. The center functions as a teaching, research and public service consortium of leading institutions. The mission of ATRC is to promote undergraduate and graduate education and research in tropical ecology, conservation biology, natural resources management, nature tourism, island culture and sustainable economic development. This report summarizes 1991-1992 operations.

Facility Maintenance and Improvements

All major buildings have received improvements, many of them major. The guest house is scheduled for closure September 1, and we will shortly begin renovation of four of the bedrooms of the guest house into computer laboratories, classrooms and a library. Two rooms will be retained for VIP housing. We currently are renovating the old staff quarters in the apartment complex into graduate student housing.

The Stream House renovation is progressing. When completed it will provide us with our second large dormitory for classes and workshops. The Bee House has been converted into housing for our resident scientist, Dr. Ross Wagenseil. Mt. Joy has received extensive renovation. The entire basement area has been closed off and converted into a field laboratory. Extra showers and toilets have been installed. Bunk beds, mattresses and pillows were purchased to accommodate the students.

We have improved the roads to Mt. Joy and the Bee House and developed a trail system throughout the property. The agricultural lands have been given special attention. Phillip Alexander is working with the government of Dominica to develop several demonstration plots for alternative tropical crops that will be used for classroom instruction and extension. We also are enhancing the coffee, cacao and coconuts and hope to have them in production soon as well. Several of these projects have support from USAID.

We have obtained a great deal of new equipment for the station. A new 10-passenger van was purchased last year as well as a new microscope. The Smithsonian Institution donated herbarium cases to the center. The U.S. Forest Service and The National Park Service have donated approximately \$60,000 in laboratory equipment. Dr. Frank Woods has donated his library to the station. Clemson University sent down a Zenith Supersport laptop computer and an Epson dot matrix printer, 10 surplus 286 and 386 computers, six printers, and a great deal of field and laboratory equipment. As part of our cooperative project with the U.S. Forest Service, we have purchased another vehicle, a tractor, a complete GIS system, and other field and laboratory equipment. This all was sent to Dominica in July in a 40 x 8 x 8 foot container.

Expansion of Consortium Membership

Bradford University and Liverpool Polytech paid their first year's dues this past fiscal year, making them our first European members. We currently are negotiating with several other European organizations in France, Germany and the Netherlands concerning consortium membership. We are continuing negotiations with several additional North American institutions as well.

Use of Springfield by Nature Tours, Classes and NGO's

The Springfield Field Station began making the facility available for classes and organized nature tour groups in early 1990. Use increased more than two-fold in 1991 and continued at this level for 1992. We hope eventually to offer between 10 and 15 classes and nature tours every year at the Field Station. During the past 12 months we have encouraged both governmental agencies and non-governmental groups to use the facilities at Springfield for meetings, conferences and workshops. This has become a very successful program, and we anticipate increasing use of the facility for these purposes in the future. Our 1991-1992 list of users follows.

Classes/Tours

Univ. Missouri-Kansas City	June 24 - July 8, 1991	Class
Union College	February 2 - 6, 1992	Class
SUNY-ESF	March 7 - 18, 1992	Class
Earth Tours	March 1992	Tour
U.S.D.A. Forest Service	May 2 - 6, 1992	Workshop
Texas A & M University	May 25 - June 14, 1992	Class
Univ. Missouri-Kansas City	June 28 - July 13, 1992	Class

Use by Governmental and Non-Governmental Organizations

Dominica Hotels Association	Monthly Meetings, 1991
Encore Assessment Team	March 1992 (1 week)
Home Industries	April 1992 (3 days)
Civil Service Assoc. (Alvin Knight)	April 1992
Small Projects Association Team	July 1992
Small Projects Association Team	October 1992

Research Visits to Springfield Field Station

We have had a large number of researchers visit Springfield to make site visits to assist in the preparation of proposals during the past year. Several studies already are under way. A summary of research-related activities follows.

Visitor/Group

Purpose

1989

Archbold Center Board	Visit center/island
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1990

Dr. Steve Hill, Clemson Univ.	Botanical Research
Dr. Gail Noblet, Clemson Univ.	Parasitology Research
Dr. Ray Damian, Univ. of Georgia	Parasitology Research
Dr. Allen Drew, SUNY-ESF	Site Visit-Forest Ecology
Dr. Susan Jewett, Smithsonian.....	Site Visit-Ichthyology
Dr. Dan Neary, USFS.....	Watershed Research
Dr. Jerry DeGraff, USFS.....	Watershed Research

1991

Dr. Steven Hill, Clemson Univ.	Botanical Research
Dr. G. Brister, Univ. of Georgia	Forestry Research
Dr. K. Steinbeck, Univ. of Georgia	Forestry Research
Dr. Peter Hannah, Univ. of Vermont	Forest Ecology
Ms. C. Stubbs, Univ. of Maine	Lichen Research
Dr. Frank Wadsworth, USFS	Forestry Research
Dr. Steve Jones, Clemson Univ.	Forest Ecology
Mr. Wes Dixon, Clemson Univ.	Forest Ecology
Dr. Mary DeChesnay, Clemson Univ.	Public Health Research
Dr. John Kelly, Clemson Univ.	Horticulture Research
Dr. Joe Tomasso, Clemson Univ.	Aquaculture Research
Dr. Arnie Eversole, Clemson Univ.	Aquaculture Research
Carnegie Museum of Natural History	Entomology
Dr. Brian Davis, Bradford Univ.	Environmental Research
Dr. Bobby Wixson, Clemson Univ.	Environmental Research
Mr. S. Voigt, Univ. of Vermont.....	Vertebrate Ecology
Dr. Kelly Mayo, MUSC	Public Health
Univ. of Pennsylvania.....	Ornithology
Dr. Ed Ruppert, Clemson Univ.	Ecology
Dr. Clark Lantz, USFS	Forestry
Dr. Frank Woods (ret.)	Agroforestry
Dr. T. Burton, Michigan St. Univ.	Ecology
Tropical Forest Action Plan	Agroforestry

1992

Dr. D. Pauli, Pharmacia, Austria	Biochemistry
Dr. H. Beck, N.Y. Botan. Gardens	Botany
Dr. R. Owen, Texas Tech Univ.	Zoology
Dr. Steven Hill, Clemson Univ.	Botany
Dr. Gil Zepeda, U.S.F.S.	Forestry
Dr. Bruce Bayle, U.S.F.S.	Forestry
Dr. T. McCarthy, Carnegie Museum.....	Zoology

Several research proposals were submitted or currently are in review. A resubmission of a proposal that was well-received by Dr. Dan Martin at MacArthur is under way. We have been encouraged by MacArthur to resubmit. Mr. Phillip Alexander is working closely with USAID, the OECS, the Pan American Development Foundation and Dominican government agencies on several research opportunities. A major opportunity is the U.S.A.I.D. funded ENCORE Project, an \$11 million project for the East Caribbean. We are attempting to secure support as a technical consultant to the project. A proposal in conjunction with the U.S. Forest Service to conduct training programs at the Springfield Field Station (\$610,000 over three years) recently was funded and work began in April.

Research at Other Tropical Sites

Brazil: The director of ATRC received a Provost's Research Award to visit Brazil to continue research activities on the ecology and conservation of the Brazil-

ian savannas. While in Brazil, he met with the three affiliate members of the ATRC consortium (Federal University of Minas Gerais, University of Brasilia and Center of Agricultural Research in the Pantanal) to plan future research activities. He is interacting with the Tinker Foundation concerning funding for the Brazil project. A Brazilian student, Walfrido Tomas, recently was awarded a fellowship from the Brazilian government to come to Clemson to work with Dr. Lacher.

Costa Rica and Panama: ATRC and Conservation International are jointly managing a major research initiative on conservation, reforestation and land management in the Pacific region of Costa Rica and Panama, sponsored by the McDonald's Corporation. We have completed the Diagnostic Phase study (\$174,371.50) and ATRC, CI and McDonald's are working together to secure additional support of approximately \$4 million to begin the implementation phase in fall of 1992. These funds now are essentially completely raised. We have met with representatives of the World Bank, the Interamerican Development Bank, other multilateral lending agencies, and U.S.A.I.D. to discuss financial assistance for a much larger study to extend this project to the global arena. These meetings have been very positive, and we are optimistic about meeting our goals.

In addition, ATRC and the Universidad Nacional in Costa Rica have received a grant from USAID (\$150,000) to fund a GIS study of the conservation network in Central America. RDG will be an active participant in this project. This will be the first study of its kind and scope for a tropical country.

Regional Development Group

The College of Forest and Recreation Resources continually has sought to develop and refine mechanisms that enhance its ability to deliver programs to its varied client groups. In 1992 the college was instrumental in building a strong, interdisciplinary work team focusing on regional development, natural resource utilization and natural resource based economic development. The program is the result of a merger of the Regional Resources Development Institute with the Strom Thurmond Institute to form the Regional Development Group — a multi-college work team at the Thurmond Institute.

Regional Development Group Projects

An Educational Partnership: John de la Howe/Clemson University. In 1987 the John de la Howe School (JDLH) and Clemson University (CU) entered into a relationship based on a memorandum of agreement that allows both agencies to synergistically utilize each other's expertise. Seldom does the opportunity arise that allows two such state agencies to work so closely together to directly enhance their students' learning opportunities. The JDLH school, founded in 1797 by Dr. John de la Howe, and Clemson University, founded by Thomas Green Clemson, are two such agencies. The future impact of the cooperative agreement is expressed by the present chief executives of both institutions:

"The greatest resource we have in the state of South Carolina is our people. We must place young people highest on the priority list because they represent our future...If we appropriately prepare them, they'll take care of us."

— President Max Lennon, Clemson University

"What we think we're accomplishing for South Carolina is to provide the kinds of services that will allow our young people to go back into the community, lead productive lives, and be the kind of parents that they ought to be."

— Superintendent John Shiflet, John de la Howe School

Students come to Clemson and JDLH with similar goals in mind. A future-oriented higher level of education and preparation motivates Clemson students. Motivating JDLH students is the hope of developing a higher level of self-esteem and putting their lives in the proper perspective. Therefore, a cooperative partnership between the two institutions naturally evolved.

A close working relationship with Clemson's Regional Development Group has resulted in the idea of an Enterprise Market Program (EMP). The basic idea of the market enterprise concept consists of a student cooperative in which all students will be involved. Through this cooperative initiative, JDLH students will produce products to sell at the market while others will be involved through partial enterprise management and/or ownership. Current student work groups expected to contribute to the EMP are involved in raising catfish, vegetable gardening, greenhouse work, container and field nursery efforts, and working with livestock including cattle and horses.

The S.C. — Today and Tomorrow Initiatives

Nature-Based Tourism and Rural Coastal Development. During the summer of 1990 the National Coastal Resources Research and Development Institute (NCRI) provided three-year funding for a demonstration project to assess the feasibility of utilizing nature-based tourism enterprises as a rural coastal/regional development strategy. Case study sites and methodology for this project were proposed by the S.C. Sea Grant Consortium and RDG.

The purpose of this project is to develop a demonstration enterprise model; that is, a nature-based tourism enterprise with the associated market demand assessment, regional site capabilities and business formation strategies. More specifically, information is being developed which is needed to encourage tourism and nature-oriented private entrepreneurial investment. Besides, fostering investment in coastal tourism as a rural coastal economic development strategy is being given high priority.

Project objectives include:

- enhancing the tourism economy of rural Georgetown, Colleton and Beaufort counties by helping create a mix of businesses and services focusing on the assets of undeveloped barrier islands, salt marshes, estuarine environs and black-water rivers;
- combining tourist-based opportunities in these natural areas with the designated natural resource preservation goals of South Carolina, associated agencies, private landholders and organizations;
- slowing coastal land conversion to high density use by providing alternative economic options and strategies for local landowners and residents;
- developing prototypical guidelines for local citizen involvement in coastal development issues; and 5) developing reports and video materials illustrating coastal nature-based tourism opportunities.

Small Town Development. RDG is actively involved with the S.C. Downtown Development Association Inc., assisting with community and economic development for small towns. Both Summerton and Allendale are serving as pilot communities. RDG also has worked with Honea Path, Donalds, Ninety Six, McClellanville and Little River.

A community survey/questionnaire has been designed for Summerton and could be modeled by other communities in the state. Other activities include serving on a Downtown Development Association Resource Team for Summerton, Allendale and Honea Path, facilitating revitalization initiatives, and working with the S.C. Foundation For Rural Revitalization.

The South Carolina Crafts Program. RDG has worked with the S.C. Crafts Association to compile a comprehensive listing of craftsmen for South Carolina.

This listing will help craftsmen market themselves and their products while helping identify those individuals interested in other institute activities.

In-Migration Housing Study. Co-sponsored by Clemson University, PRTM and the Housing Institute, this study will help identify housing needs and preferences of retirees considering a move to South Carolina. This is the initial phase which will analyze the retirement market segment, assess housing market parameters and delineate this market segment's contribution to the economy of South Carolina.

In addition, this study will help clarify the decision-making process that retirees use when choosing where to locate, while concurrently developing market profiles. These profiles will depict the various segments within the retirement housing market.

African American Traveler Study. In cooperation with the Department of Parks, Recreation and Tourism Management, RDG has initiated a study to profile the African American traveler. Little research has been done on this segment of the traveling public and many states, particularly those in the Southeast, could benefit from this information.

ACADEMIC AFFAIRS

Clemson University Libraries

Introduction

1991-92 was a year of internal examination as well as one of planning for the future. A great deal of staff energy was expended studying the organization of the Libraries and beginning the strategic planning for the future. Concurrently, the Libraries continued to increase services and collections for its users.

New Structures

The Taskforce on Organizational Structure was initiated in the fall of 1991 and concluded its deliberations in the spring with a report to the library faculty and the Classified Staff Council. The task force consisted of staff from all levels within the Libraries, faculty and classified staff. The recommendations which were adopted by the two groups established a new organizational structure, which was implemented in May 1992. This new structure, which emphasizes the team approach to operations and decision making, has been adopted to allow the Libraries to take advantage of the knowledge and experiences of its staff, to move quickly to take advantage of opportunities in the future, to develop and maintain strategic plans and to provide for continuous improvement.

The new structure includes two new operational units: Resource Sharing and Copier Services, and Records Management. The former was created by taking components from the Reference and Circulation Units, and the Records Management Unit was split off from the Special Collections Unit. The structure also provides for units which have the greatest interaction to work together in coordinating teams. The administrative area was changed to have a director and two assistant directors, one of which is the department head. These three individuals make up the management team. An Administrative Council was formed to deal with policy issues. Its membership includes the members of the management team, a representative from each of the coordinating teams, faculty senator, chair of the Classified Staff Council and the systems librarian. A number of teams have been created to deal with a variety of issues. Some of these teams are permanent, and others are temporary. The teams are initiated at all levels within the Libraries, from library-wide teams to unit-

based teams. The membership of the library-wide teams specifically ensures participation and input from all levels of staff and faculty.

Planning for the Future

During the year the library faculty, working through its Library Advisory Committee, began the process of strategic planning for the Libraries. A vision statement, mission and basic goals were adopted for the Libraries. In addition, the initial work on establishing benchmarks was completed. This process now has been transferred to the planning and assessment team to make recommendations on the benchmarks with a goal of having them completed by the end of 1992. Further, the Libraries adopted a document, "Organizational Philosophy," which delineates the qualities we wish our staff to have and retain.

The Clemson University Vision Statement is, "The Clemson University Libraries will be a national leader in providing access to information and in educating individuals for effective life-long learning."

Staff Development

To complement the work being done in organizational structure and planning, several staff development activities were accomplished during the year. A staff-wide workshop on team building was held. A "Unit of the Month" program was implemented where each unit created displays for the public and provided orientation for staff.

New efforts have been made to recognize staff members for their efforts. "TY-GER Awards" have been instituted which permit staff to recognize other staff throughout the year for work that has been beneficial to them or to others. In addition, the Libraries held an all-day team building workshop conducted by Employee Development.

The staff honored Ms. Rhonda Patton as our Classified Staff Employee of the Year for 1991. Ms. Patton has been and continues to be one of our outstanding employees who is dedicated to providing information and materials to our users.

In the restructuring of the organization, the former associate director's position was made into three positions: a reference librarian, assistant architecture librarian and a classified position.

Services

The Libraries assumed responsibility from Student Government for the operation for the coin-operated photocopy machines in the Libraries. This additional responsibility was given to the Circulation Unit. A full-time person was added from the copier revenues to manage this important service. Additional machines were acquired, student assistants employed and standard daily procedures were developed and implemented. As a result, the service has been successful since its implementation.

In an effort to improve access to materials housed in the Libraries, a major program was initiated to provide a page service which not only kept the shelves stocked, but also provides immediate assistance to users having difficulty finding materials. This page service was manned by approximately 100 hours of work-study students. These pages were scheduled to work every hour the library was open and provided constant pick-up and re-shelving of materials and were available to assist users in locating materials.

As a means to help address the Southern Association of College's concerns about study space in the Libraries, and to provide additional study space, the Libraries requested and received funds to make the second floor of Daniel Hall available for study. A guard was employed, and the facility was heavily used. This space provides an additional 500 study spaces. By making this facility available for students seeking a location for study, this freed space in the Libraries for users who needed to use the resources housed in the Libraries. This service was augmented by the language and computer labs in Daniel Hall remaining open longer hours.

During the year there was a 2 percent increase in use of the facility. Circulation of the Libraries' materials increased by 13 percent during the year, now approaching 300,000 circulations. EDDIE, the Libraries' document delivery program, continued its growth, also by 13 percent, in use by faculty and staff. We now are delivering more than 26,000 items to users.

Our reference staff increased its productivity by responding to an 11 percent increase in queries. Computer searches for information increased by 15 percent, a figure totaling more than 54,000 searches.

Inter-library loan activity showed an increase in the number of items we loaned to other libraries and a slight decrease in the number of items we borrowed from other libraries. The average cost of each item we borrowed was \$2.74. More than half of all inter-library loan borrows are for graduate students.

Our bibliographic instruction effort remains strong. During the year our staff gave presentations to more than 5,700 users on the Libraries and how to use it.

The Libraries entered into an agreement with the Enterprise Development Inc. of South Carolina to provide professional library support to the Center for Applied Technology in Pendleton. This year-long grant provides funding to support the establishment of an information center to assist businesses in South Carolina. It is envisioned that this operation will be self supporting, but will use the Clemson University Libraries as its primary source of information for its clients.

Collections

The Libraries felt the impact of a high rate of inflation of periodical subscription prices, especially those published abroad. It was necessary to reduce our subscription list by 165 titles (\$113,000) during 1991-92 to cover the inflation in our periodicals budget. This was done only after we had used almost all of our income from private sources as well as \$100,000 of our salary savings to shore up the expenditures for monographs.

An additional 11,421 monographic titles were received during the year for an expenditure of \$472,617. To protect journals purchased, government documents getting greater use, and books with heavy circulation, more than \$81,000 was expended for binding.

Our large government document collection is becoming more and more accessible each day. During the year a project was initiated to add cataloging records to the Libraries' online catalog for all government documents housed in the Libraries. This project has become feasible due to the availability of cataloging records for these materials from a commercial vendor. This database of bibliographic records of government documents also is available online to users of the Libraries. Its presence has contributed greatly to the increased accessibility of these materials and therefore their use.

The Libraries have been a depository for U.S. government documents for almost all the Libraries' history. At the end of the year, we received word we had been selected as a U.S. Patent Depository. This new designation will mean that we will receive patent information for future patents from the Patent Office. Our responsibility is to acquire the patents for the past 20 years. We are working on an agreement which will allow us to make these acquisitions with little or no expense. With the addition of this resource, our faculty and researchers will find it much easier to research potential patents for their work. It will also be a resource for companies and industries in South Carolina.

Several major collections additions were made in our Special Collections Unit. In the University Archives the completion of four significant series of records, representing a total of 289 cubic feet, were opened for use. The largest of these collections provides access to the records of the Cooperative Extension Service from 1917 to 1988. This collection is an excellent primary source of the agriculture development of the state of South Carolina. Currently these records are being used by a graduate student to write a doctoral dissertation. Another significant collection made available to researchers of Clemson University history is that of the Faculty

Senate. These records span a period of 91 years and document the development of participatory governance at a military college and, later, a coeducational institution of higher education.

At the beginning of the year the Libraries, through its Special Collections Unit, were awarded a \$71,689 grant from the National Historic Public Records Commission for a two and one-half year textile project. The purpose of the project is to arrange and describe the unprocessed backlog of textile records held by the Libraries which document the history of the S.C. textile industry.

Two very significant rare book collections were added during the year. A collection of Southern literature books, donated by Mr. Louis Rubin of Chapel Hill, continues to be received, and portions of these gifts qualify for our rare book facility. A wonderful genealogical collection — the Adlai Yates Genealogy Collection — was received, consisting of approximately 1,200 volumes. This collection of genealogical materials concentrates upon the South and was donated by Mr. Yates' daughter, Mrs. Sallie Box.

Record Management

The records management staff made significant progress in the completion of its goal of the physical inventory of the records of the entire University. Based on the current situation, this goal will be achieved in 1995. This group is providing statewide leadership to the scheduling of records stored on electronic media.

To assist it in fulfilling its responsibilities, and to provide microfilming opportunities for agencies within the University, the Records Center acquired a Kodak MRD-2 planetary camera for the production of microfilm.

Exhibits

Four major exhibits and five smaller ones were prepared and installed by the Director of Exhibits, Ms. Susan Hiott. The major exhibit of the year was a two-part exhibit, "World War II and the Clemson Community." This exhibit, which began in the lobby of the Cooper Library and continued in the Special Collections exhibit area in the Strom Thurmond Institute Building, was on display for six months and had its own brochure.

Automation

The Libraries continued the work of improving its automated systems. Additional databases were added to DORIS, and a great deal of effort is going into the installation of the latest upgrades to the system software for NOTIS. Some screen changes were made with EDDIE as well as an improvement to let EDDIE users know their messages had been received. Provision also was made so that on-campus faculty and staff borrowers could use EDDIE to notify our document delivery staff of materials to be returned to the Libraries.

OCLC, our source of cataloging records as well as our medium for inter-library loans, has been changing its pricing algorithms. These changes require a change in our workflow to avoid any increased cost. One such change is a process to use a tape-loading mechanism to update our holdings in OCLC rather than an on-line process. This change reduces the number of searches required, thus reducing charges, and has allowed us to reassign staff.

Conclusion

A year of change, a year of preparation for the future — this has been 1991-92 for the Clemson University Libraries. As a staff both individually and collectively, we are better prepared to continue our planning and a steady improvement in the services and collections to our customers.

Library Statistics — 1991-1992

COLLECTIONS

Books/Journals	Accessioned	Withdrawn	Net Added	TOTAL
Cataloged	33,440	528	32,912	766,642
Uncataloged				2,519
Total				769,161
Documents and Reports				715,967

Microfilm	Microfilm	Microfiche	Microcard	Vol. Equiv.*
Public Docs	1,523	1,270,875	0	128,611
Other	23,300	636,140	31,499	90,064
Totals	24,823	1,907,015	31,499	218,674

GRAND TOTAL — PRINTED MATERIALS **1,703,802**

** Microform volume equivalents are determined by counting microfilm reels as one volume and 10 microfiche or microcards as one volume*

Slides	82,123
Maps	18,984
Videotapes	414

Current Subscriptions	1990-91	1991-92
Periodicals	6,132	6,035
Other Serials	1,082	1,082
Totals	7,214	7,117

CIRCULATION

Door Count of Users

Cooper	912,687	930,241
Gunnin	80,059	100,676
Totals	992,746	1,030,917

Books Circulated

Cooper	252,894	285,303
Gunnin	23,236	25,172
Totals	276,130	310,475

REFERENCE SERVICES

Inquiries

Reference Desk	59,600	66,249
Telephone Reference	1,382	1,348
Liaison Reference	3,062	4,800
E-Mail Reference	24	32
Totals	64,068	72,429

Computer Connects for Searches

Quick	2	0
Do-It-Yourself	2,363	2,150
Reference	62	59
Research	106	65
DORIS	47,606	54,864
Totals	50,139	57,138

Inter-library Loans

Loaned	7,876	8,703
Borrowed	10,245	8,904
Totals	18,121	17,607

Computing and Information Technology

Computer Center

Long-term computing trends which have been evident for the past few years continued in 1991-92. Mainframe usage continued to increase, primarily in the areas of research and administrative support, while at the same time there was an overall movement toward the greater use of networked personal computers.

Computing service remains extremely reliable which is increasingly important as more of the University's information systems are put on-line. The library, in particular, is making increasing use of computer-based systems and demands a high level of reliability.

The decade of the nineties is a time of transition for computing. It is clear that the traditional mainframe, while not by any means dead, has reached its apogee. What is not so clear is what will replace the mainframe, or what form a redefined mainframe might take. The Computer Center therefore is positioning itself to take advantage of whatever technological advances and technological shifts take place.

A concentrated effort is under way to put in place a telecommunications network for the next century. The network connects the major buildings on campus through fiber optic cables, and fiber also connects the campus to the Clemson Research Park and to statewide commercial fiber systems. Dormitories are expected to be wired within the next year to connect each room to the network.

As an alternative to traditional mainframe systems, the operating system UNIX, running on anything from a personal computer to a mainframe, is getting increased attention. Once the sole province of the academic, UNIX is now gaining a foothold in administrative computing. As it increases in functionality and robustness, it is likely to find a substantial following on the administrative side.

The Computer Center maintains a number of public access microcomputer laboratories for students. Departments now are reserving those laboratories for classes to such an extent that they can no longer be considered public access during the day. To address this problem the center is planning to move from a large number of relatively small laboratories reservable for classes to a smaller number of large ones that will be non-reservable. This will be done by 1995 and will require colleges to develop plans for their own dedicated facilities.

Computer Center revenue has remained stable for the past few years despite several rate cuts. Since most of that revenue comes from other state agencies, particularly health service agencies, this is a cause for some concern in a time of statewide budget cuts.

The Division of Computing and Information Technology (DCIT) has developed a draft of a strategic plan for computing at the University. This draft is now under discussion by the various interest groups within the University and is expected to yield a firm plan before the end of the next academic year. This plan will set the trend for University computing for the next decade.

Information Systems Development

DCIT provides information technology services to organizations outside the University through Information Systems Development (ISD), a self-supporting group within DCIT. Contract levels increased modestly in 1991-92, but new contracts for 1992-93 will result in a significant increase in ISD activity assuming no cutbacks in funds at the contracting agencies.

ISD is continuing to seek business opportunities outside of state government. While state agencies in South Carolina continue to provide the bulk of ISD revenue, non-state business has been slowly growing. Where possible, ISD is putting together partnerships with commercial companies and the Clemson University Research Foundation (CURF) to bid on government contracts. Having the commercial company as prime, subcontracting work to CURF which in turn subcontracts to ISD, enables ISD to obtain contracts with the minimum of overhead. ISD consists almost exclusively of full-time professional systems developers and has no marketing and a minimal support staff.

ISD has developed a commercial grade software package for CURF that is marketed by Storage Technology Corporation of Louisville, Colorado. This package, used to manage the operation of tape-mounting robots, now is marketed and in use by major corporations world-wide. Revenue from the sale of this software is used by CURF to support other R&D computing projects in DCIT and to provide support for academic computing at the University.

Administrative Programming Services

Administrative Programming Services (APS) develops and supports information systems for all areas of Clemson University. Its role is to provide computer applications support to central administrative units as well as to all faculty, students and staff. In doing so, APS provides direct services to about 20,000 members of the University community.

In 1991-92 the largest and most extensive project for APS was the new University-wide purchasing system. This system, designed by a joint Business Office and DAPS team, automates all major portions of the extensive University procurement process. The system employs the new Electronic Forms Management system that supports electronic routing of requisitions and other actions through administrative channels to various databases. Another major project now being completed is the design and programming of a new system for Institutional Advancement to support all fund-raising and alumni services. This system represents the first large-scale relational database for University systems and provides new features needed for this critical University area.

The most visible project completed this year was the new student on-line registration system. In April 1992 the system first was used by all continuing students to register for upcoming summer school and fall classes. Although the University will require several semesters to implement all of the recommendations of the committee proposing the system, students reacted favorably to receiving instant confirmation or denial of a course request. All Clemson students receive a computer user ID upon enrollment that can be used for class registration, career placement services, campus housing signup and retrieval of academic records and exam schedules.

APS continued to support and enhance 60 administrative systems throughout 1991-92. In a typical business day, some 600 faculty and staff members use student, academic and business on-line systems. Additionally, about 400 students access the Student Information Services system on a typical day. During peak periods of registration and housing signup, several thousand students access the on-line

systems each day. Not included in these figures are the hundreds of faculty and students who use the library on-line catalog (LUIS) and the related reference databases found in the DORIS system each day.

A major thrust in recent years has been to provide direct access by all members of the campus community to administrative databases. The INTELLECT natural language access tool is gaining increasing acceptance by persons with ad-hoc requests for student and personnel information. New tools are being provided that provide direct links from INTELLECT and other systems to PCs and other workstations.

Looking to next year, APS will be working with others to move University systems to a distributed environment. In fact, several model systems are now being installed in cooperation with interested departments. Also, there is general agreement that the methods for determining administrative systems strategy should be revised. To that end, APS is working with the newly formed Administrative Computing Advisory Committee to develop a new methodology for defining and setting implementation schedules for strategic University systems as well as other related systems.

The Graduate School

Six new graduate degree programs were approved by the Commission on Higher Education with starting dates as indicated: M.S. and Ph.D. in Environmental Toxicology (spring '92), Ph.D. in Curriculum and Instruction (spring '92), M.S. and Ph.D. in Genetics (fall '92) and M.A. in Professional Communications (fall '92). The programs in genetics, offered jointly by the College of Agricultural Sciences and the College of Sciences, represent the culmination of four years of study and discussion by the two colleges.

Completed applications for the 1991 fall semester set a record 5,737, an increase of 43 percent. Forty-one percent of the pool of applicants was accepted, and this value has remained rather constant over the past five years. The values to follow for enrolled students represent record highs: total enrollment 4,126 (+15 percent), new enrollees 1,255 (+43 percent), full-time enrollees 1,894 (+30 percent), females 1,903 (+11 percent) and internationals 723 (+33 percent). While the nation's economy is a significant factor in such increases, both nationally and locally, the birth of new programs in the period 1989-91 cannot be discounted.

The Graduate School was placed administratively under the Vice President for Research, and Jay Gogue was named Graduate Dean on an interim basis. A national search is under way for a Vice Provost and Dean of the Graduate School who will report to the Provost and Vice President for Academic Affairs.

The National Dropout Prevention Center

Mission

Founded in 1986, the National Dropout Prevention Center (NDPC) has established a national reputation in the area of dropout prevention and educational reform of our public school system. The NDPC is a partnership of concerned leaders who represent business, educational and policy interests, and Clemson University. It was created to significantly reduce America's dropout rate. The center is committed to meeting the needs of youth in at-risk situations by shaping school environments which ensure that all youth receive the quality education to which they are entitled. The NDPC has worked to accomplish this mission by providing information services, action research and technical assistance.

Information Services

The NDPC is a national clearinghouse on issues related to dropout prevention, at-risk youth and school reform. As such, the center provides information on a daily basis to thousands of clients each year.

The core of its information services is the FOCUS Database, a nationally accessible computerized database located in DORIS, the Clemson University Library locally mounted database. The NDPC collects, abstracts and disseminates information in the five files in FOCUS: Program Profiles; Calendar of Events; Resource Materials Library; Organizations; and Consultants and Speakers. Users from all over the country benefit from this state-of-the-art resource. In addition, by a special arrangement with New York City Public Schools, the FOCUS Database is provided to them via local access. The center also has worked with the National Association of Temporary Services (NATS) to develop a file on the FOCUS Database disseminating information on the model dropout prevention programs that the members of NATS are implementing in their communities.

The center staff also disseminates information via a quarterly newsletter, periodic research-based monographs, numerous other publications and videotapes. This past year, publications have included *The Evaluation Handbook*, a guide to successful evaluation of dropout prevention programs; *Service Learning*, a research report on integrating community service into the curriculum of our schools; and *The Mentoring Guidebook*, a publication which has been instrumental in the establishment of numerous mentoring programs in this country and Canada. In addition to their distribution through the National Dropout Prevention Network, approximately 10,000 publications have been sold nationwide this year.

In the past year, the center sponsored a series of workshops, "Staying In," in 17 cities across the United States. The workshops, conducted by George Smith of People Builders International, Inc., introduced close to 1,000 participants to the multitude of issues related to at-risk youth and brought positive recognition to the National Dropout Prevention Center and Clemson University.

The NDPC employed three graduate students over the past year from the College of Education's Guidance and Counseling program. Their experiences in research and technical work have been mutually beneficial, with several center publications and presentations resulting from their efforts. In addition, a new relationship with the sociology department began this summer with a graduate student internship.

The center's work in information services serves as a strong foundation for its other activities. These other functions both draw upon and enhance the information base of the NDPC.

Action Research

As it has from its inception, the center has been involved in a variety of action research projects in 1991-1992. School sites from across the country are laboratories for program and product development on critical dropout prevention issues. NDPC involvement with the Lifelong Options Program (LOP), the Pine Belt Educational Consortium and Centerville Elementary School were highlighted this year.

This academic year marked the third and final year of implementation of the U.S. Department of Education grant to demonstrate the Lifelong Options Program. Operating in three local sites in three different states (South Carolina, Florida and Maryland), LOP offers potential dropouts a chance to earn a high school diploma and acquire valuable work skills and experience through vocational education. In cooperation with S.C. ETV, two videos have been produced to document the success of this project and have been disseminated to vocational education directors of each state. With The Ohio State University as a collaborating partner, a handbook describing the nuts and bolts of program implementation and management also has been produced and disseminated to educators throughout the country. In conjunction with the LOP project, the center has produced and disseminated a publication, *Vocational Education for the 21st Century*, prefaced by U.S. Secretary of Education

Lamar Alexander, and a companion video, "Rising to the Challenge," featuring LOP and nine other dropout prevention programs which use vocational education as a major program component.

The center also is involved in the Pine Belt Regional Service Center (PBRSC) project in Laurel, Mississippi. Funded through a federal grant in March 1992, the PBRSC serves approximately 125 at-risk students from eight school districts across six counties who need a nontraditional and innovative approach toward completing their education. The center's role in this project is to provide staff development activities and conduct formative evaluation of this unique school setting.

When Centerville Elementary School in Anderson District Five began writing a proposal for a Federal Dropout Demonstration Assistance Grant, NDPC provided information on model programs from the FOCUS Database and advice about writing the proposal. In the fall of 1991, the school was awarded more than \$300,000 for the first year of the four-year project. Written into the proposal as the third-party evaluator, NDPC has assisted Centerville Elementary in identifying data necessary to establish baseline measures and collection procedures for ongoing evaluation of the project. In addition, center staff has assisted in developing data collection instruments for caseworker reports, for surveying parent perceptions, and for measuring self-esteem in primary grade students.

Action research has enabled the NDPC to become a national leader on the cutting edge of successful dropout prevention initiatives.

Technical Assistance

The center provides technical assistance in developing and submitting proposals, planning and implementing staff development activities, program planning and evaluation, setting up mentoring and service learning programs, and broadening collaborative networks. This past year has seen the NDPC working with Visions for Youth, the Virginia Department of Education, the U.S. Army, the Niagara Peninsula Industry Education Council, the National Association of Partners in Education (NAPE), the S.C. Higher Education Awareness Program (HEAP), the Office of National Service at the White House, Chattanooga Public Schools, and Scholastic Action Magazine.

Center staff provides technical assistance to the county Vision agents and serve on the State Council for the Visions for Youth project sponsored by the W.K. Kellogg Foundation. One major task completed this year was the Visions for Youth State Conference featuring Senator Nell Smith and Dr. Jack Minzy as keynote speaker.

The Virginia State Department of Education is requiring each school district in the state to submit in 1992-93 a comprehensive plan for reducing the dropout rate in the district. NDPC was asked to provide training to teams from all the districts in the state in strategies for dropout prevention, comprehensive planning and developing mentoring programs. The first in a series of three institutes was presented May 12-13, 1992. The second in the series is scheduled for October 20-22, 1992.

NDPC was asked by the Young and Rubicam Army Group to assist, for the second time, with refining the concept of the U.S. Army's "Stay in School" campaign and providing expertise on appropriate content for an updated video.

In partnership with the Niagara Peninsula Industry Education Council (NPIEC) and funded by the Ministry of Education of the Canadian Government, the NDPC presented a two-day session on mentoring in Niagara Falls, Ontario. Center staff first introduced participants, which included school personnel, representatives from business and industry, and community leaders, to the concept of mentoring. NDPC then worked with four teams of participants to design individual mentoring programs for their specific schools. On a return trip, NDPC staff trained the recruited mentors. NPIEC now is in the process of replicating the process in other schools.

The center has collaborated with the National Association of Partners in Education to undertake a nationwide search to discover the most creative and innovative school volunteer partnership programs focused on dropout prevention. This pro-

ject, Finish for the Future, has several corporate sponsors including Burger King Corporation and will produce a publication listing model volunteer programs for others to use.

HEAP is a program designed to provide eighth graders in South Carolina information on and motivation toward thinking about higher education alternatives after high school. The NDPC has served in an advisory capacity to the Commission on Higher Education in the development of the media and handouts used for this program, as well as assisting in the planning and initial presentation of this program to pilot schools in the state.

The NDPC serves the Office of National Service at the White House in the capacity of a consultant for their daily Points of Light selection. The center has in fact nominated three Points of Light programs from the FOCUS Database, including the Adopt-a-Cub Program at Daniel High School with whom the center has been associated since its founding in 1989.

At the request of the Chattanooga Community Foundation and the Chattanooga Public Schools, NDPC is observing current practice in the Chattanooga Public Schools in the areas of guidance and counseling, school leadership and decision making, curriculum and instruction, and parent and community involvement. The objective is to compare current practice with both the district's vision and what research identifies as best practice in order to increase student academic achievement. "Together We Can," a partnership between the Community Foundation and the Public Schools, provides scholarships for those economically needy high school graduates who are accepted by a college or university. The foundation intends to use the recommendations of the NDPC report to seek additional funding to improve the quality of the district's student support system so that students coming from at-risk circumstances have the opportunity to compete for the scholarships.

NDPC is contacted by companies to review print and video material designed to be used with students in at-risk situations. Staff recently have reviewed print materials for Chronicle Guidance Publications, Inc. and Media Management Services, Inc. In addition, the National Dropout Prevention Center's executive director serves on the advisory board of *Scholastic Action Magazine*, a monthly publication written for secondary students whose reading level is below grade level. In conjunction with Scholastic, the NDPC has produced a poster designed by kids that encourages their fellow students to stay in school, and this poster will be distributed nationally.

A new tradition is being established at Clemson University — the National Dropout Prevention Center's Summer Leadership Institute. This July 15-19, the second annual Summer Leadership Institute was held at the Clemson House with 60 attendees from 15 states, American Samoa, Russia and Canada. The theme this year was "Focus on Success: Increasing Lifelong Options." Thirty-six presenters guided the participants through a week of workshops carefully designed to support the daily theme and presented in a wide variety of approaches. In addition, Tech Prep Day was held on Friday of the institute week in collaboration with the nationally recognized Tech Prep Program at Tri-County Technical College.

The major network with whom the NDPC is involved is the National Dropout Prevention Network. This Network of some 3,000 members is guided by an executive board of national leaders representing educators; policymakers; community, business and labor groups; parents; and other concerned persons. The NDPC functions as the network's fiscal agent, providing information services and technical assistance to members located in all 50 states and several foreign countries. One of the major joint efforts of this partnership is the national conference held each year in the spring. This past year, the National Dropout Prevention Conference was held in Pittsburgh. Center staff provided two all-day conference presessions, one on evaluation of programs and the other on setting up a mentoring program. The conference culminated with an inspirational speech by General Colin Powell, underscoring the critical need our society has for educating all of our youth.

Conclusion

The National Dropout Prevention Center has surged to a position where its contributions to education are significant and far-reaching. Its agenda for the future builds upon this position of strength, and the center envisions a year of considerable national impact in 1992-1993.

The Strom Thurmond Institute

The Strom Thurmond Institute is Clemson University's flagship public policy organization. It is dedicated to the principle that broad access to knowledge and a free exchange of ideas will result in more effective government. The institute, therefore, sees as its purpose the promotion of awareness of public policy issues among citizens and the promotion of interest in public sector problem solving throughout the University's teaching, research and public service activities.

The Institute accomplishes its mission through three major avenues: its Public Policy and Regional Development Programs, its Public Events and Lecture Series and a Publications Program. The scope of the Strom Thurmond Institute's programs is national and international, but its focus is on South Carolina. Furthermore, as a public policy and regional development center for a land-grant university, the institute will continue to place emphasis on rural and community development issues in South Carolina.

Public Policy and Regional Development Programs

The Public Policy and Regional Development Programs at the institute have involved many areas of domestic and foreign policy. During 1991-92 the major areas of emphasis were Decision Technologies, Economic Policy, Regional Development, and State and Local Government Policy. Other research and public service activities in which the institute has been engaged in the past include energy emergency planning, engineering and technology policy, water policy, comprehensive land-use planning, taxation policy, county needs assessments, econometric modeling, and municipal incorporation.

Decision Technologies: The Decision Technologies research agenda addresses the role of computer technologies in the decision-making processes associated with environmental policy, natural resource management and community development. The decision tools presently being utilized include remote sensing, geographic information systems (GIS) and the global positioning system (GPS). Decision Technologies projects include the following:

Wetlands Information Services: This three-year wetlands mapping project started in 1992. The project is funded through NASA's Earth Observation Commercialization Applications Program. Projects in this program typically are joint research ventures between private businesses and universities. The Strom Thurmond Institute's business partner is Applied Analysis, Inc. (AAI), based in Billerica, Massachusetts. The objective is improving wetlands delineation and marketing the database for development planning purposes. The project integrates remote sensing, GIS and GPS for wetlands mapping. It is anticipated that once the procedures are in place for the study area — Beaufort and Jasper counties — AAI will be able to market the process nationally.

Gap Analysis Mapping of Diversity of Biological Resources: This is a two-year project with the Archbold Tropical Research Center of Clemson University and the Regional Wildlife Management Program at Universidad Nacional in Costa Rica. The project tests a conservation mapping model proven in the United States in Costa Rica, and it establishes data requirements for the international application of the model.

A Database and Mapping Framework for Assessing the Implications of Climate Change on the Southeastern United States: This project, conducted jointly by the Strom Thurmond Institute and the Department of Planning Studies for the Southeast Regional Climate Center (SERCC), is providing a database and mapping framework for climate analysis in the Southeastern United States. GIS was used to generate an atlas and data matrix for climate and hydrology stations, producing a land-cover map of the region. This process provides SERCC with a database that displays either data associated with particular geographic points or geographic points associated with certain data parameters.

Economic Policy: In 1991 the institute initiated the Economic Outlook Project. This program, directed by former institute Director and Senior Fellow, Bruce Yandle, focuses attention on the national, regional and state economies through a series of Economic Outlook Conferences, regular reports on the economic situation, columns for newspapers and special programs presented to business and civic groups and public sector organizations throughout the country.

Regional Development: This area of research, which is a joint venture between the Strom Thurmond Institute and the College of Forest and Recreation Resources, focuses on regional development, natural resource utilization, and natural resource-based economic development. Regional development projects include the following:

An Educational Partnership: John de la Howe/Clemson University: In 1987 the John de la Howe School (JDLH) (founded in 1797 by Dr. John de la Howe) and Clemson University entered into an agreement that allows both agencies to synergistically utilize each other's expertise to enhance their students' learning opportunities. The Enterprise Market Program (EMP) at JDLH consists of a student cooperative in which JDLH students will produce products to sell at the market while others will be involved through partial enterprise management and/or ownership. A 1930s era CCC barn has been renovated with the assistance of students from the College of Architecture and will serve as the market place for the EMP. JDLH students are involved in raising catfish, vegetable gardening, greenhouse work, container and field nursery efforts and working with livestock, including cattle and horses.

Nature-based Tourism and Rural Coastal Development: During the summer of 1990 the National Coastal Resources Research and Development Institute (NCRI) provided three-year funding for a demonstration project to assess the feasibility of utilizing nature-based tourism enterprises as a rural coastal/regional development strategy. This project is developing a nature-based tourism enterprise model with associated market demand assessment, regional site capabilities and business formation strategies. Project objectives include enhancing the tourism economy of rural Georgetown, Colleton and Beaufort counties by helping to create a mix of businesses and services focusing on the assets of undeveloped barrier islands, salt marshes, estuarine environs, and black-water rivers; combining tourist-based opportunities in these natural areas with designated natural resource preservation goals; slowing coastal land conversion to high density use by providing alternative economic options and strategies for local landowners and residents; developing prototypical guidelines for local citizen involvement in coastal development issues; and developing reports and video materials illustrating coastal nature-based tourism opportunities.

Small Town Development: The institute is actively involved with the S.C. Downtown Development Association, Inc. in assisting with community and economic development for small towns. Both Summerton and Allendale are serving as pilot communities. The institute also has worked with Honea Path, Donalds, Ninety Six, McClellanville and Little River.

The South Carolina Crafts Program: The institute has worked with the S.C. Crafts Association to compile a comprehensive listing of craftsmen for South Carolina. This listing will help craftsmen market themselves and their products while helping identify those individuals interested in other institute activities.

In-migration Housing Study: Co-sponsored by Clemson University, the Department of Parks, Recreation and Tourism Management, and the Housing Institute, this study will help identify housing needs and preferences of retirees considering a move to South Carolina. This is the initial phase which will analyze the retirement market segment, assess housing market parameters, and delineate this market segment's contribution to the state's economy. In addition, this study will help clarify the decision-making process that retirees use when choosing where to locate, while concurrently developing market profiles. These profiles will depict the various segments within the retirement housing market.

African-American Traveler Study: In cooperation with the Department of Parks, Recreation and Tourism Management, the institute has initiated a study to profile the African-American traveler. Little research has been done on this segment of the traveling public and many states, particularly those in the Southeast, could benefit from this information.

State and Local Government Policy: As part of a land-grant University, it is appropriate that the institute expend a major part of its effort on assistance to state and local government agencies as well as to citizen groups attempting to improve services provided by state and local government. Research and public service activities in 1991-92 in this area included numerous consultations with local government officials on such issues as consolidation of service provision, coordination of development and services among adjacent communities, the local option sales tax, and other issues; presentations to various groups on economic development, demographic changes, etc.; and the annual Harris Page Smith lectures which feature speakers on issues facing county and municipal governments in South Carolina.

With a grant provided by the Appalachian Council of Governments, the institute presented two seminars on financial management of small water and sewer systems to local government officials.

The institute publication, *Financing Government in the Palmetto State: A Study of Taxation in South Carolina*, authored by Robert D. Ebel, Holley Ulbrich and Laurence Marks, was designated a notable State Document of 1991 by the S.C. State Library.

Public Events and Lecture Series

Through its public events and lectures, the institute complements the instruction presented to Clemson students in the classroom and brings new information on public policy issues of concern to the public. During 1991-92 the institute sponsored or cosponsored more than 45 public lectures, panel discussions, conferences and seminars on a wide range of public policy issues. The major events are listed below.

Third Thursday at the Thurmond: One of the more popular program series has been the "Third Thursday at the Thurmond." On the third Thursday of each month during the academic year a program is presented at 7:30 p.m. in the institute auditorium. This year's "Third Thursday" programs were: syndicated columnist Juan Williams, "Eyes on the Prize: History of the Civil Rights Movement"; Judith Huntington, American Nurses' Association, "Nursing's Agenda for Health Care Reform"; Thomas Stelson, pro-vice chancellor, Hong Kong University of Science and Technology, "New Partnerships Between Universities, Government and Industry for Economic Development"; Terry Anderson, Natural Resources Economist, Montana State University, "Environmental Policy in the 1990s: The Market Approach"; Dennis Avery, Hudson Institute, and George McDowell, Virginia Polytechnic Institute and State University, "The Future of Agriculture and the Land-Grant University"; Barbara Nielsen, S.C. Superintendent of Education, "Total Quality Education."

Thurmond Roundtable Discussion Series: This program provides opportunities to selected faculty, students and guests to engage in discussion of topics of current interest. Usually one faculty member or visiting scholar will present remarks to introduce the topic, after which the discussion will be opened to all participants. Topics addressed during 1991-92 included an update on the Strategic Defense Initiative, arms control, changes in the national labor market, the U.S.-Mexico Free Trade Agreement, and siting of waste and toxic facilities.

Strom Thurmond Seminar in Government and Politics: 1991-92 was the 10th year in which the institute has conducted this seminar in government and politics on an issue of interest to high school and middle school social studies teachers. Twenty teachers are selected on a competitive basis to participate in the seminar. The first week is held on the Clemson campus and consists of lectures and guided discussions on various aspects of the topic for that year by Clemson faculty and invited lecturers. The second week is spent in Washington, where seminar participants are afforded the opportunity to visit government and private agencies dealing with the issue at hand, spend time on Capitol Hill in discussions with members of Congress, and hear lectures and guided discussions by policy makers and opinion leaders. This year's seminar topic was "The Collapse of the Soviet Empire and the New World Order."

Harris Page Smith Lecture Series: The third annual Harris Page Smith Memorial Lectures on Local Government in South Carolina were held on November 14, 1991. The series was begun by the institute in 1989 to honor the late Senator Harris Page Smith. The speakers, who are the presidents of the S.C. Association of Counties and the Municipal Association of South Carolina, address the major issues, challenges and opportunities facing county and municipal governments in the state. Speakers this year were James R. McGee, president of the S.C. Association of Counties and Mary Y. Clark, president of the Municipal Association of South Carolina.

Publications

The institute operates an extensive publications program to disseminate the results of its research and public program activities. The institute's mailing list exceeds 15,000 and includes colleges and universities, high school libraries, research institutes, government agencies, private organizations, business corporations and interested individuals throughout the United States and numerous foreign countries. The publications program includes a lecture series, proceedings of conferences and symposia, research reports, special reports, white papers and working papers. Publications released during 1991-92 include the Harris Page Smith Memorial Lectures; four editions of "The Community Leader's Letter," a newsletter published quarterly by the Community and Economic Development Program; a special report on "Superfund—The S.C. Experience: Assessing the Effects of the Statute on Local Communities"; one discussion paper; two lectures; five research reports; three other special reports; 12 working papers; and one bibliography.

Joint Public Policy Programs

Some programs operating under the umbrella of the Strom Thurmond Institute represent joint ventures between the institute and other organizations on campus. This usually means that other colleges or departments contribute resources to the program in the form of funding and/or personnel, and the institute serves as the facilitating agent. Such is the case with two programs currently being operated within the institute: the Community and Economic Development Program and the Environmental Policy Program.

Community and Economic Development: In July 1989 the institute signed an agreement with the Cooperative Extension Service and the S.C. Agricultural Experiment Station to conduct the Community and Economic Development program for

the benefit of rural communities throughout the state. In 1992 this agreement was extended to include the College of Commerce and Industry and Clemson University's Office of Public Affairs. While federal subsidies for local government programs have declined significantly, federal and state mandates regarding solid waste management, hazardous waste treatment, water quality and other issues have increased dramatically. Rural communities have felt the impact of these negative trends even more, as young people have migrated to the cities, small towns have seen businesses move to the bypasses and the outlet malls, and young professionals such as doctors, lawyers and educators seek their fortunes in larger metropolitan areas.

The importance of the Community and Economic Development program cannot be overstated. It is one of the vehicles through which Clemson will transform itself into the model land-grant University of the 21st century. By combining the strengths of academic units across the campus, Clemson will broaden its definition of public service to include not just the traditional agricultural and agribusiness sector, but education, research and service throughout all academic disciplines. Through the Community and Economic Development program, Clemson will make all of the science, technology and policy research being developed on the campus available to all communities of South Carolina, but particularly to the rural communities that are in need of assistance.

In 1991-92 the Community and Economic Development Program provided advice and consultation to communities and government entities on a wide range of policy issues, including water planning, economic development, solid waste management and consolidation of public services.

The program continues to publish a quarterly newsletter, supported by the Clemson Cooperative Extension Service, that is mailed to 15,000 grassroots leaders throughout the state. Articles from this newsletter have been quoted in newspapers across the state.

To help develop thinking on the campus and in the surrounding community about economic development issues, a biweekly series of lunch time economic development workshops was begun this year. Every two weeks a speaker is invited to present some remarks on an economic development issue, after which comments and discussion are invited from the attendees.

Environmental Policy Program: One of the four major focal points of Clemson's strategic plan is the environment. In accordance with that plan, the institute established the Environmental Policy Program in 1990. Much already has been done at Clemson in the areas of environmental science, environmental engineering and wildlife and environmental toxicology. To solidify that momentum the Environmental Policy Program will coordinate interdisciplinary environmental activities with a policy focus, will foster interdisciplinary policy research and ultimately intends to develop a graduate program in environmental policy.

Visiting International Scholars Program

The institute offers a Visiting International Scholars Program whereby distinguished foreign scholars are brought to the institute for a semester to conduct research. While they are on campus these international scholars also are afforded opportunities to share their expertise and perspectives with students through lectures, seminars and classroom instruction.

Foreign scholars from Australia, Colombia, India, Nepal and the Republic of China (Taiwan) have contributed to this research while guests of the institute. During 1991-92 the Visiting International Scholar was Professor Philip Maxwell, head of the School of Economics and Finance at Curtin University of Technology in Perth, Western Australia. While at the institute, Professor Maxwell conducted research on rural economic development, conducted seminars and produced two working papers dealing with the subject of regional per capita income divergence in the United States, Canada and Australia.

Undergraduate Studies

The Undergraduate Studies Office is responsible for undergraduate academic programs and curricula, academic standards, scholarships and awards, University-wide lectures, new faculty/staff orientation, summer sessions, the Clemson Career Workshops, the Junior Scholars, the Science and Technology Entrance Program, the Calhoun College honors program, Cooperative Education, special post-graduate scholarship programs and special University ceremonial occasions.

In curricular matters, the "general education" component of all undergraduate education is being restudied by faculty committees to ensure that all students are well-prepared to deal with the complex challenges of modern life.

The Honors Program reached 793 students in 1991-92. Ninety-two students graduated with Senior Departmental Honors in December, May and August. One Clemson student received a Goldwater Scholarship while five students were awarded National Science Foundation grants in 1992. Three major lectures: one on environmental issues in the 1990s, the second on Chartres Cathedral, and the third on science literacy, attracted standing room only audiences. The Science and Technology Entrance Program, designed to aid marginal students in agriculture, forestry, textiles and industrial education technology to have meaningful access to Clemson University, has enrolled its fourth class. Retention rates on students who entered in this program are slightly better than those of regular entrants. The first entrants have begun graduating.

Cooperative Education continues to be a leader in our region. More than 660 students participated this year throughout the United States and Europe in more than 860 successful work assignments in industry, commerce and government.

A number of students from the Governor's School for Science and Mathematics spent the summer in research projects on the campus at Clemson and at the University Research and Education Centers located throughout the state. About one third of the graduates of the Governor's School have become Clemson students.

The 1992 summer sessions generated more than 44,000 credit hours, which is slightly more than last year. During the summer, Clemson's commemoration of the 500th anniversary of Christopher Columbus' voyage began with Natalie Davis of Princeton University and James Axtell of William and Mary College speaking. Fall speakers will include David Buisseret of the Newberry Library and A. Crosby of Texas A & M.

The Clemson Career Workshops continue to be a primary recruiting program for minority high school students. The University expects 55 new freshmen recruited by this program to enroll in the fall of 1992.

The Junior Scholars and Summer Science and Engineering programs bring academically talented students between the ninth and twelfth grades for summer enrichment programs on campus. Now in its eighth year, this program enrolled 453 students in the summer of 1992.

Planning is under way to commemorate the 100th anniversary of the opening of Clemson Agricultural College July 7, 1893, in the fall of 1993.

Undergraduate Admissions, Records and Registration, and Financial Aid

The 1991-92 academic year marked the highest (total) University enrollment with 17,295 students registered for classes — 14,428 full time and 2,867 part time. This represents an increase of more than 6 percent from last year. Of the total enrollment, 4,010 were graduate students.

The College of Commerce and Industry had the 2nd highest collegiate enrollment with 3,729 students. The College of Engineering was first with 4,019, followed in order by Education (2,869), Sciences (1,769), Liberal Arts (1,869),

Agricultural Sciences (1,028), Architecture (726), Forest and Recreation Resources (595) and Nursing (510).

Higher education continued to become increasingly accessible as evidenced by the number of freshmen entering college with advanced standing. In the 1991-92 fall semester, new high school graduates entered Clemson with advanced standing by means means of College Board Advanced Placement courses (641 students, 6,354 credit hours) and by concurrent enrollment in high school and college or enrollment in summer school (189 students, 1,101 credit hours).

At Clemson, performance in high school has proven to be the best single predictor of success in the freshman year. The class ranks of entering freshmen remained stable, with 36 percent of the class entering in fall 1991 ranked in the top 10 percent of their class, 61 percent in the top 20 percent and 93 percent in the top 50 percent. The freshman class average Scholastic Achievement Test (SAT) score of 1,028 compared with a national average of 896 reported by the College Board for all high school seniors. Clemson's freshmen average of 1,028 also is the highest average among state-supported institutions in South Carolina. Of the 8,782 new applications for admission processed for 1991-92, 6,956 were accepted, and 3,225 actually enrolled (freshmen and transfer students).

Clemson students come from all 46 South Carolina counties, 45 states, Puerto Rico, the District of Columbia, and 74 foreign countries. South Carolina residents accounted for 68.6 percent of the 17,295 students. Greenville County continued to have the most students enrolled (1,839). Anderson County was second with 1,266, followed in order by Pickens, Oconee, Spartanburg and Lexington counties. Most out-of-state students came from Georgia (534), Virginia (420) and North Carolina (418).

Computerized preregistration helped the record number of students get off to a smooth start for fall classes. Approximately 83 percent preregistered and had their course schedules completed before they arrived on campus to begin classes.

Fall Semester Enrollment Comparisons for Recent Years

Year	Undergraduate	Graduate and Others	Total
1972-73	7,686	2,071	9,757
1973-74	7,910	2,202	10,112
1974-75	8,171	2,415	10,586
1975-76	8,576	2,785	11,361
1976-77	8,620	2,763	11,383
1977-78	8,708	2,566	11,274
1978-79	8,925	2,553	11,478
1979-80	9,291	2,457	11,748
1980-81	9,427	2,152	11,579
1981-82	9,918	2,008	11,926
1982-83	10,151	1,983	12,134
1983-84	10,217	2,242	12,459
1984-85	10,488	2,438	12,926
1985-86	10,434	2,459	12,893
1986-87	10,360	2,702	13,062
1987-88	10,970	2,895	13,865
1988-89	11,774	3,020	14,794
1989-90	12,563	3,509	16,072
1990-91	13,010	3,293	16,303
1991-92	13,285	4,010	17,295

The enrollment of women at Clemson reached an all-time high during the 1991 fall semester. There were 7,540, of which 5,693 were undergraduates. Enrollment

of undergraduate women increased more than 2 percent from last year, and women continue to constitute approximately 43 percent of the undergraduate enrollment.

The Clemson student body continues to be a working group, receiving a significant amount of financial assistance through loans, grants, scholarships and employment. Clemson awarded 828 long-term loans totaling \$692,900. The University also approved and certified 3,160 guaranteed student loans with a total value of \$7,767,598 from a variety of lending institutions. Excluding donor-selected scholarships, 2,632 scholarships and grants valued at \$5,204,023 were awarded. The number of students receiving Pell Grants was 2,078, with awards totaling \$3,177,944. In all, about 55 percent of the undergraduate student body received an estimated total of \$26.5 million in financial assistance.

Number and Percent of Black Students			Average College Board of Freshmen	
Year	Number	Percent	Year	Score
1972	179	2	1972	995
1973	211	2	1973	982
1974	216	2	1974	984
1975	338	3	1975	983
1976	307	3	1976	996
1977	336	3	1977	985
1978	290	3	1978	1,000
1979	341	3	1979	1,002
1980	305	3	1980	1,005
1981	325	3	1981	1,007
1982	429	4	1982	1,017
1983	472	4	1983	1,014
1984	528	4	1984	1,012
1985	671	5	1985	1,012
1986	714	5.47	1986	1,025
1987	690	5	1987	1,028
1988	789	5.3	1988	1,032
1989	1,004	6.2	1989	1,025
1990	1,075	6.6	1990	1,035
1991	1,240	7.2	1991	1,028

**Student-Faculty Ratio
(Full-Time Equivalent)**

Year	Ratio
1972	14.6:1
1973	16.8:1
1974	17.9:1
1975	18.3:1
1976	17.6:1
1977	16.3:1
1978	15.9:1
1979	16.0:1
1980	15.6:1
1981	16.4:1
1982	16.6:1
1983	17.0:1
1984	16.1:1
1985	15.4:1
1986	16.9:1
1987	18.3:1
1988	18.9:1
1989	19.7:1
1990	19.8:1
1991	21.2:1

**Number in Freshman Class
(New Students)**

Year	Freshman
1972	1,919
1973	2,034
1974	1,949
1975	1,901
1976	1,861
1977	1,838
1978	2,020
1979	1,998
1980	2,008
1981	2,284
1982	2,321
1983	2,122
1984	2,188
1985	2,259
1986	2,239
1987	2,818
1988	2,885
1989	2,900
1990	2,513
1991	2,461

**Number of Teachers
(Full-Time Equivalent
Teaching Faculty)**

Year	Teachers
1972	614.9
1973	578.4
1974	591.8
1975	602.5
1976	611.3
1977	654.4
1978	675.6
1979	691.8
1980	718.2
1981	709.7
1982	720.9
1983	713.5
1984	762.5
1985	797.3
1986	731.24
1987	713.93
1988	755.48
1989	769.33
1990	791.31
1991	766.34

**Number of On-Campus Students
in Summer School**

Year	Number
1972	5,232
1973	6,267
1974	5,997
1975	6,275
1976	6,100
1977	6,301
1978	6,393
1979	6,708
1980	6,858
1981	6,897
1982	7,149
1983	7,442
1984	7,418
1985	8,126
1986	8,562
1987	8,446
1988	8,689
1989	9,039
1990	9,873
1991	10,502

**Fall Semester 1991 Enrollment by Colleges and Degrees Awarded
December 1990-August 1991**

	Total Enrollment Fall Semester	Degrees					Total
		Associate	Bachelor's	Master's	Specialist	Doctorates	
Agricultural Sciences	1,028	0	66	45	0	11	122
Architecture	726	0	120	63	0	0	183
Commerce and Industry	3,729	0	793	165	0	5	963
Education	2,869	0	290	203	5	5	503
Engineering	4,019	0	459	149	0	24	632
Forest and Recreation Resources	595	0	93	12	0	5	110
Liberal Arts	1,869	0	315	30	0	0	345
Nursing	510	0	40	8	0	0	48
Sciences	1,769	0	191	61	0	18	270
Non-Degree	181						
Total	17,295		2,367	736	5	68	3,176

Degrees awarded since 1896 (through August 1991) total 74,202 of which 426 have been associate degrees; 58,806 bachelor's degrees; 13,611 master's degrees; 165 education specialist degrees; and 1,194 doctorates. Includes 582 Clemson-Furman MBA degrees awarded May 1972-August 1991.

DIVISION OF ADMINISTRATION AND SECRETARY OF THE BOARD OF TRUSTEES

The Division of Administration was created August 1, 1985, in conjunction with the Secretary of the Board of Trustees. The fundamental responsibility of the Administrative Division is to formulate, monitor and coordinate fiscal matters for the Office of the President as well as other areas of University administration. The vice president for administration assists the president in discharging his general administrative and executive functions and represents the president during his absence. The secretary of the board reports directly to the Board of Trustees. He records all proceedings of the board and its committee meetings, is the custodian of the University seal and all records of the board, and performs other duties as may be assigned by the Board of Trustees.

The vice president for administration supervises the director of public safety, who oversees the Fire and Police Departments; the assistant vice president for human resources, who is responsible for the Center for the Study of the Black Experience; and the Department of Parking and Vehicle Registration, which is an auxiliary department. The University municipal judge relies on this vice president for administrative and logistical support.

The internal auditor is under the cognizance of the secretary of the Board of Trustees, who, in turn, is responsible to the Board of Trustees.

A report on each unit of the division follows.

Clemson University Fire Department — Emergency Medical Service

Major Accomplishments FY 1991-92 include:

- Firefighters (suppression personnel) received reclassifications to accurately reflect job duties and responsibilities.
- Received delivery of 1500 GPM pumper (Engine 1), a 50/50 purchase agreement between the Commission on Higher Education and the City of Clemson.
- Received title for Engine 4, leased/purchased by City of Clemson in 1988.
- Secured the transfer of old Engine 1 to the City of Clemson for future use.
- Eliminated apparatus Rescue 1 from fleet and transferred apparatus to City of Clemson for future use.
- Experienced no loss time injuries or property accidents in excess of \$250.
- Operated department within budget despite \$18,186 reduction during fiscal year.
- Conducted fire safety education programs and evacuation drills in all dormitories.
- Completed plans review and compliance inspections on all active campus construction projects.
- Inspected all existing campus structures a minimum of two times.
- Inspected, and maintained as needed, 2,500+ fire extinguishers on campus.
- Received site approval for relocation of fire department training facility to Ravenel Research Park.

Center for the Study of the Black Experience Affecting Higher Education

With its mission to promote the increased participation of African American stu-

dents and faculty in postsecondary education always at the forefront, the center is engaged in activities designed to bring us closer to that goal. Our efforts are centered on the four components that make up the framework of center activities: research, dissemination, demonstration and evaluation.

We have assembled a cadre of research associates to focus on issues such as tracking and testing, minority recruitment, student athletes, early childhood education, participation of minorities in science, mathematics, and engineering, curriculum diversity, and the education pipeline. The center will compile and publish the results of their research at year's end to make their findings available to all interested parties. In addition, our newsletter, *Challenge*, is published and distributed quarterly to further disseminate information collected by the staff as well as our research associates.

In the area of demonstration, the center is engaged in a consortium to advance the participation of African Americans in the sciences. This program will be funded for a five-year period. In addition, we are cosponsors with Greenville Technical College of the Summer Science Enrichment Program for middle school students.

We continue to be involved in the evaluation and review of procedures to increase minority participation in higher education and recently completed an evaluation for the Commission on Higher Education of programs designed to promote curriculum diversity.

Human Resources

The Office of Human Resources coordinates and directs the University's affirmative action and desegregation plan efforts. The department is actively involved in recruiting black faculty, staff and graduate students, mediating grievances based on alleged illegal discrimination, conducting an educational and counseling program for sexual harassment, being responsible for state and federal statistical reporting, and developing projects to meet the objectives of equal opportunity and desegregation.

For academic year 1991-92, the University had 39 blacks with academic status, including five administrators. This represents an increase of one black administrator and an increase of four non-administrative faculty. Black nonacademic administrative staff decreased from 15 to 13. Black graduate students increased from 142 to 188 in 1991.

Internal Auditing

The staff of the Internal Auditing division consists of eight members: an associate vice president, an audits manager, EDP audits supervisor, an audits supervisor, two staff auditors, a business manager and a half-time word processing operator. The associate vice president reports administratively to the secretary of the Board of Trustees.

The division provides an ongoing, independent audit function for the University as a service to management. Audit parameters include financial, compliance and operational review, as well as special requests.

Municipal Judge

The staff of the University's Municipal Court consists of two judges: a full-time judge who serves as the department head and one part-time judge who serves in the absence of the chief judge and on weekends and special occasions. Also, the staff includes a clerk of court and one student secretary. Formerly known as the University recorder (recorder's courts were abolished in 1980 by act of the General Assembly), the judge for the municipality of Clemson University hears appeals and renders decisions on all campus parking violations brought before the court, tries all

persons charged with violating any ordinance passed by the Board of Trustees and any state laws that fall within the jurisdiction of the municipal judge (any crime or traffic violation for which the maximum penalty that can be imposed does not exceed \$298 or 30 days in jail).

The municipal judge also issues bench warrants, search warrants and arrest warrants for incidents arising on campus.

Department of Parking and Traffic Control

The Department of Parking and Traffic Control is responsible for managing the parking program for the University. This responsibility includes maintaining parking spaces and lots, planning and implementing construction and new parking lots, and vehicle registration and maintenance of parking violation records. For 1991-92 the department issued 20,737 decals and deposited \$288,596 for the sale of decals. For the same period, 47,182 parking citations were issued by the University Police Department, generating \$586,616 in revenue.

The shuttle bus service, begun in August 1988, has completed four years of operation. For the academic year 1991-92 bus operations began on August 18, 1991, and continued through December 13, 1991, with the exception of Saturdays and holiday periods for a total of 99 days. During the spring semester 1992, bus operations began on January 5, 1992, and continued through May 1, 1992, with the exception of Saturdays and holidays for a total of 96 days.

A shuttle bus route to Research Park and TIWET near Pendleton was begun during fall semester 1991. The service to TIWET was stopped during spring semester 1992 due to lack of ridership. For the first time since bus operations began, the buses were driven by the contract drivers. Crowe's Inc. was awarded the contract.

Almost 698,378 passengers rode the buses for a total cost of \$295,958. The average ridership was 3,545 per day, and the cost per passenger was 30.5 cents.

Police Department

During 1991-92 the Police Department responded to 10,527 calls for service. Police efforts during the year resulted in 241 arrests (a 62 percent increase) with \$50,612 in fines resulting from convictions. Crime rate statistics reported in SLED's *Crime in South Carolina 1992* indicated a decrease in crimes reported at Clemson University during 1992. In addition to normal activities, the department provided services for 143 special events. John McKenzie was named director of public safety and has provided support and leadership to the division.

Investigative Division

The Investigative Division assembles facts and evidence to document a reported incident, identify offenders and assist in the administration of justice.

This division also performs background investigations, coordinates the protection for VIPs to campus when requested, and helps present public safety programs.

Accomplishments of the division include:

- In aiding the task force to locate Norsaadah Husain, (the task force consisting of Pickens County Sheriff Department, SLED and the Central Police Department) University investigators put in hundreds of hours in aiding the attempt to locate Norsaadah Husain.
- Successfully investigated and prosecuted several cases involving University personnel.
- Investigators participated in several speaking engagements where they presented information to students on topics of current interest including drug abuse and fake identification cards.

- Provided in-service training to investigators in various topics.
- Provided protection for five dignitaries during their visits to campus.
- Supervised the activities of 38 Pre-Trial Intervention participants who provided many hours of public service to various University departments.
- The division operated with an average case load of 194 active cases per investigator, a 56 percent increase over last year. This included several time-consuming investigations into white-collar type criminal activity. Follow-up investigations resulted in 50 arrest warrants being obtained for criminal prosecution.

Uniformed Patrol Division

Uniformed patrol officers move about campus to deter and detect criminal activity, preserve order, direct traffic, investigate accidents, and enforce state laws and University parking regulations. Additional services provided by the division include monitoring intrusion and fire alarms, providing dispatch service for fire and EMS and evening dispatch services for FM&O and campus shuttle buses, and maintaining traffic signs and street markings. Significant accomplishments of the division include:

- The traffic safety program provided defensive driving instruction to campus citizens. Enforcement of traffic laws included the issuance of 940 traffic citations which resulted in fines totaling \$24,205.
- This division provided one full-time officer to the Norsaadah Husain task force and other officers who searched on horseback during the initial search.
- Parking enforcement efforts resulted in 47, 182 citations issued from July through May. With the citations that were issued due to the enforcement of parking regulations, the end result was fines totaling \$586,626.
- Preventive patrol efforts suffered as the result of a cutback in funding for contract security officers. The 1992-93 budget allocations were not sufficient to restore all contract security positions. During the year, 1,426 escorts were provided to campus citizens.
- The variety of training subjects and hours of in-service training required by the S.C. Criminal Justice Academy continued to increase to maintain certification for sworn personnel. During the 1991-92 year, 1,317 hours of training were provided to police personnel, and annual emergency vehicle operation training was added to existing core and legal requirements.

Administrative Division

The Administrative Division is responsible for developing and presenting public awareness programs, the supervision of student police officers, and working with victims of crime by providing services and information to help them cope with the criminal justice system and with the stress caused by victimization. Additional responsibilities of the division involve criminal evidence management and inventory of departmental keys and equipment. Significant accomplishments of the division include:

- Updated and provided safety-related programs to new students, international students and employees through orientation sessions.
- Established objectives, provided handbooks to police personnel and identified materials and supplies needed to comply with the federal Hazardous Substances Information Act. Limited budget prevented purchase of necessary safety equipment.
- Presented various programs on a variety of public safety topics to more than 6,500 participants.

- Participated in special programs during Victim Awareness Week and Rape Awareness Week and provided training to participants of the University Rape Crisis Volunteers and Peer Educators programs.
- Assisted in providing community service programs for the Residential Life Judicial Review Program and for the Student Life judicial program.
- Provided victim/witness services to 779 campus citizens.
- Participated in the Foothills Crisis Response Team which supports victims and witnesses in the Pickens/Oconee County area—an area housing a large proportion of commuting students. The University responded to two crisis incidents.
- Student police officers assisted the department by providing 1,825 hours during special events, 819 hours painting street markings, 17 hours special surveillance and 4,361 hours for athletic events, traffic direction, parking enforcement, dispatch and VIP transport services.
- Initiated and presented a shoplifting program for campus staff.
- Assisted with Norsaadah Husain disappearance by providing safety awareness information to international students.

The needs for meeting the demands of the future include:

- Completion of computerized NIBRS data entry storage project.
- Immediate need for ample storage and expanded operating facilities to combine public safety operations into one area because of needed close communications and to prevent duplication of effort.

BUSINESS AND FINANCE

Business and Finance is responsible for determining the broad policies of institutional functions relating to administration, business and finance, and for managing specific administrative, fiscal and auxiliary functions. These departments comprise more than 1,000 full-time, part-time, and contract employees responsible for managing financial resources in excess of \$72 million. The vice president for business and finance has targeted five categories for a division-wide emphasis on improvement. These categories, Governmental Relations and Communications, Quality and Leadership, Strategic Planning, Environment, and Internal Control, and the accomplishments of Business and Finance departments are discussed in the sections which follow.

Governmental Relations and Communications

Working in cooperation with other members of the campus community, Business and Finance helped enhance Clemson's relationships with a variety of Clemson constituencies. Members of the Business and Finance staff increased efforts to establish and renew contact with state agencies including the Joint Bond Review Committee, the Commission on Higher Education and the Division of General Services.

New versions of the *Clemson University Personnel Policies and Procedures Manual* and the *Clemson University Sponsored Programs Policies and Procedures Manual* were distributed to the campus. Revisions were made to the *Clemson University Fiscal Policies and Procedures Manual* and the *Clemson University Budgets and Financial Planning Policies and Procedures Manual* to ensure all faculty and staff had access to updated policies.

Quality and Leadership

Beginning with an organization review by the firm of Deloitte and Touche, Business and Finance has been committed to a discipline of continuous improvement. The Continuous Improvement Program is dedicated to streamlining processes, eliminating waste, changing the organization's culture, focusing on quality issues, and controlling and reducing administrative costs.

Business and Finance has completed eight internal reviews of administrative processes. These reviews fully document existing process and recommend improvements. In addition to the internal reviews, the Food Service and Facilities Planning and Management areas were examined by peer review teams consisting of nationally recognized administrators from other colleges and universities.

Business and Finance also has initiated seven cross-functional committees to advise the vice president on various policy issues. These cross-functional committees are the Quality Review and Advisory Committee, Accounting and Business Standards Review and Advisory Committee, Facilities Review and Advisory Committee, Financial Planning Review and Advisory Committee, Investment Review and Advisory Committee, Human Resource Review and Advisory Committee, and Compliance and Cost Standards Review and Advisory Committee.

Strategic Planning

The Business and Finance commitment to strategic planning was demonstrated by the publishing of the Business and Finance Strategic Plan in January 1992. The strategic plan details long-term (strategic) and short-term (tactical) goals and objectives designed to establish an efficient, service-oriented organization.

Environment

Environmental issues are a major part of Clemson's future, both academically and operationally. Facilities Planning and Management worked with the Environmental Committee to support recycling efforts of paper and aluminum can products. The Environment Committee and individual faculty were consulted on the environmental impact and research potential of the power plant expansion. University officials have worked with faculty, local officials and private business on waste management issues including developing additional landfill space. The campus energy officer expanded conservation efforts to include new initiatives approved by the president, and Dining Services introduced new, recyclable packaging in its cost operations. Printing Services retrieves all pieces of trimmed paper for collection, and recovers negative developing solutions with silver content for salvage. Printing inks also were replaced with vegetable-based soybean inks, and recycled paper is available for printing jobs.

Internal Control

Accountability is increasingly critical as organizations move to codify appropriate internal controls; this is not only a response to past problems, but also an attempt to provide a more consistent measuring tool. A hierarchical model containing nine components has been presented by the Committee of Sponsoring Organizations which includes the AICPA and the IIA. These components are:

- Integrity, Ethical Values and Competence
- Control Environment
- Objectives
- Risk Assessment
- Information Systems
- Control Procedures
- Communication
- Managing Change
- Monitoring

Ethics and competence are the base upon which the other components rest. Monitoring is given as the last, and smallest component, for if all the other components are in place, findings in the monitoring phase should be minimal.

Business and Finance has begun applying this model to Clemson University by utilizing task forces and cross-functional committees to improve control procedures, develop updated information systems, develop an ethics policy and assess risks.

Budgets and Financial Planning

The University's beginning budget for current operations for FY 1991-92 exceeded \$304 million, an increase of 7.5 percent over the prior year. However, state appropriations continued a downward trend due to the economy. As a result, Clemson's total Education and General appropriations were reduced approximately \$8 million and the Public Service Activities appropriations were reduced approximately \$3.5 million.

Funding for Clemson University in FY 1992-93 will fall short of the Commission on Higher Education (CHE) full formula funding by more than \$36.4 million. Full formula funding would have yielded \$116.8 million in state appropriations; however, Clemson will receive only \$80.4 million, excluding separate allocations for increases in base pay and related fringe benefits. The inequities resulting from the last fiscal year's deviation from the established formula distribution still persist. Clemson will receive 68.8 percent of full formula, while higher education statewide was actually funded at 72.1 percent. An equitable distribution of formula funding at 72.1 percent would have increased Clemson's appropriation by \$3.8 million.

Clemson's full formula amount, the measure of funding needs used by CHE, grew by \$9.2 million over FY 1991-92. Actual appropriations for FY 1992-93, however, were only \$1 million more than initial state appropriations on July 1, 1991. Given the magnitude of this shortfall, serious deficiencies caused by low levels of state funding in recent years will continue to exist. The University's service to students and the state of South Carolina is accomplished through its available resources, primarily its faculty and staff, equipment and facilities. Adequate salaries for employees, research support, out-dated research and instructional equipment and unfunded deferred maintenance projects will continue to present major budgetary needs.

The approved full time student fee increase for FY 1992-93 is 5 percent, with slightly lesser increases in part time and graduate fees. This reflects a commitment from the University to keep student fee increases from escalating dramatically. In light of the continuing deficiencies in state funding, it is increasingly difficult to maintain fee increases at reasonable levels. The increase for S.C. residents over the last six years ranges between 8.7 percent in FY 1987-88 to 5 percent in FY 1992-93, with the average annual increase equal to 6.23 percent.

Inflationary pressure also affects student fee increases. The Consumer Price Index for FY 1990-91 was 5.4 percent; the probable rate for FY 1991-92 is 3.4 percent. A better measure of inflationary pressure in higher education is the Higher Education Price Index (HEPI), which was 5.3 percent for FY 1990-91. Though the HEPI is not forecast, analysts recommend using a two to four year average of the HEPI for planning purposes. This average rate is 5.6 percent for the past two and three years.

The state has mandated a 2 percent base pay increase for state employees next year, which will require \$2.1 million from the E & G budget. State appropriations will provide \$1.2 million, leaving Clemson to fund \$1 million from University generated funds such as student fees and expenditure reductions. This is due to the fact that the state prorates the pay increase appropriation by the ratio of state funded salaries to total E&G funded salaries.

The University has earmarked an additional \$1.2 million for employee compensation over the state mandated raises. Of this amount, \$.8 million is provided to re-

store a program began four years ago to raise faculty salaries to the average of peer institutions. From FY 1988-89 through 1990-91 the University has allocated a total of \$2.3 million from the Educational and General budget for this purpose. No state appropriation for pay increases of any kind was made in FY 1991-92, and the University was unable to fund the faculty program from institutional funds.

In FY 1992-93, faculty, department heads and deans will receive \$.8 million in salary adjustments, selected faculty raises and promotions, and summer school raises. A comparison of Clemson's average faculty salaries by rank to those of peer institutions shows progress was made from FY 1987-87 through FY 1990-91. However, Clemson fell further behind peers in FY 1991-92.

Also included in the \$1.2 million in supplemental compensation is \$.4 million allocated to restore the Classified Staff Reclassification program. Four years ago Clemson began a more systematic approach of identifying positions deserving an upgrade based on increased responsibilities and salary comparisons with the labor market. This effort, like the faculty effort, fell victim to the budget constraints in FY 1991-92. The FY 1992-93 compensation related allocations also include \$1.1 million to cover the increased cost of fringe benefits due to inflation and the above mentioned salary increases.

Clemson uses a unique budget center concept to manage institutional resources. Over the last three years a variety of actions have been taken in the form of quality initiatives to reduce or curtail the operating costs of the institution. In spite of these efforts, the University will be required to reallocate more than \$1.4 million in resources from academic and administrative budget centers to other uses.

Other expenditure reductions utilized in FY 1992-93 include elimination of the midyear equipment base budget, eliminating funding of programs previously supported by the formula, and other reductions. Expenditure reductions supporting the E&G budget for FY 1992-93 total \$3.1 million, including the budget center reductions above.

Budget Office

- University operating budgets were prepared reflecting the allocation of resources approved by the Board of Trustees.
- Annual budget requests were prepared and submitted to the state. This included estimating revenues and expenditures of funds by program and by major budget object categories, estimating FTE positions and reconciling budgets to appropriations.
- During the year, meetings and written correspondence were provided to the campus to assure strong communications on budgetary issues.
- Published a budget and financial plans document providing executive summaries of the budget processes and detail explanations of the revenues and expenditures on the source and application of funds statement.
- Responded to SACS recommendations on budgetary controls.
- A budget analysis report was published in July 1991 to translate Clemson's budget into a format understandable to individuals unfamiliar with the accounting and budgetary practices of a university.
- The budget office continued the evolution of its "shadow" formula database to that used by CHE to determine the economic impact of formula revisions.
- Served on committees and initiated monthly meetings with campus units likely to incur budget problems.
- Met with University personnel to update the University's billings to related organizations.
- Drafted a policy establishing a review procedure when budget centers need to borrow funds to finance capital projects or major equipment purchases.

- Worked with other areas of Business and Finance to assess the financial controls over the foreign MBA programs.
- Developed an R-base application to assist in the year-end close process.

Managerial Accounting

- Served on a utility task force to review the utility billing process.
- The indirect cost proposal was prepared and submitted. The proposal included a space-utilization study.
- The Managerial Accounting Office completed its first systematic review or "scrubbing" of the indirect cost process to insure compliance with federal indirect cost regulations.
- Worked with the internal auditing department to select a random sample of expenditures for testing compliance with federal indirect cost regulations.
- Drafted a policy establishing the guidelines for the financing of space at the University.

Financial Planning

- Approached completion of the five year financial plan which will provide three years of historical and two years of projected data and analysis.
- Monitored the financial impact of new academic programs proposed to CHE.
- Assisted in the development of a tuition projection model to interface with a new enrollment projection model developed by Institutional Research.
- Determined the financial impact to the University of varying enrollments and mixes of students.
- Assisted the budget office with the budget and financial plans document that provided executive summaries of the budget processes and detail explanations of the revenues and expenditures on the source and application of funds statement.
- Assisted in assessing the impact of new employee tuition assistance legislation.
- Served on the patent committee.

Facilities Planning and Management

This program area includes planning, project and construction management, and maintenance activities of the University's facilities, including campus master planning, real estate development, property records, capital building projects, utility services and information systems.

Progress in campus building and renovation programs continues in line with the 10-year facilities plan, representing more than \$350 million in projects initially approved in September 1987 and updated in the spring of 1992. Projects now under construction include the Brackett Hall renovation, the demolition and reconstruction of Johnstone Hall, renovations/additions to Lee Hall, and the Brooks Center for the Performing Arts. An animal research compliance facility, the Engineering Innovation Building and a renovation of Harcombe Dining Hall are scheduled to begin construction during FY 92-93. Several projects for agriculture, including a fruit research station, renovations to Newman Hall and Poole Agriculture Center, and a lodging building at the 4-H Cooper Leadership Center also are in the construction phase. A research building housing the Department of Environmental Systems Engineering in the Research Park was completed and occupied in May 1991. The Academic Learning Center (Vickery Hall), East Campus Housing (Lightsey Bridge Apartments), the T. Ed Garrison Livestock Arena, a student cafe, and the Thornhill Village Community Center also have been completed within the last two fiscal years. Projects entering the design phase include the new Student Center, an addi-

tion to Jervey Athletic Center, the Visitors Center, a renovation of Kinard Annex, and an addition to the Service & Support Building for Duplicating Services.

More than a dozen projects consistent with the campus Capital Renewal and Replacement Plan were under design or construction in 1991-92. These included eight re-roofing projects, improvements to the heating, ventilation and air conditioning systems in Poole Agricultural Center, and an upgrade of the electrical system in Poole. Two new parking lots and phase one improvements to the campus storm drainage system were completed in FY 92. Additionally, numerous minor renovations to academic and administrative buildings, including classroom upgrades were implemented.

Facilities Information Systems continued to support the division through enhancements to the MPAC (Maintenance Planning and Control) system. A continued effort produced an accounts payable interface from MPAC to the University check writer. Several other areas were identified for integration including the MPAC purchasing system with the University PIC system, the stand-alone SARA system for capital project planning, and the custodial micro-system database. A labor reporting system was developed within the MPAC system to allow all labor entry from a single source document to provide for work order chargeback and payroll preparation reporting. All craft personnel were trained to access mainframe employee information as well as the MPAC system. Enhancements were made to the micro-based utility meter reading system. Internal procedures were revised to follow EDP standards for audit control.

Facilities Planning and Management continues to improve services and to identify new and innovative ways to implement projects on the Clemson campus.

Fiscal Affairs

Capital Financing

The Office of Capital Financing manages and directs the University's long-term capital financing program and financial information system for all present and future University capital projects. Major accomplishments of this office for 1991-92 included:

- Coordinated the issuance of \$14,885,000 Student and Faculty Housing Revenue Bonds to finance demolition and reconstruction of Johnstone Hall — phase one. Required extensive interface with bond counsel and financial adviser.
- Coordinated the issuance of \$6,935,000 Stadium Refunding Bonds Series 1992 to refund the previously outstanding Stadium Refunding Bonds Series 1985A. This refunding resulted in a present value savings of approximately \$350,000 to the University. Required extensive interface with bond counsel and financial adviser.
- Coordinated the issuance of \$3,795,000 State Institution Bonds Series 1992B to finance the renovation of Brackett Hall — Phase II and repairs to the Strom Thurmond Institute roof.
- Finalized the following lease/purchase agreements requiring extensive contact and coordination with lessor, State Treasurer's Office, and in some cases, an escrow agent:
 - \$250,000 financing of grid system/sound stage for the Student Union.
 - \$169,293 financing of soil testing equipment for the Agricultural Service Lab.
 - \$459,706 refinancing of airplane for the Athletic Department resulting in substantial interest savings.
 - \$130,799 financing of Taco Bell Kiosk and dry cleaning equipment for Business Services.

- \$316,684 financing of ID card system upgrade for Card Access System and bucket truck and wood chipper for the Grounds Department.
- Initiated procedures for obtaining financing for the following:
 - Approximately \$300,000 for equipping a new laser lab for the chemistry department.
 - Approximately \$200,000 for new X-ray equipment for Redfern Health Center.
 - Approximately \$59,767 for a new front end loader for Facilities Maintenance and Operations.
 - Approximately \$50,000 for new bowling equipment for the Student Union.
 - Approximately \$57,581 for new office and studio equipment for the College of Architecture.
- Streamlined and standardized procedures for executing and closing lease purchase agreements.
- Participated as a member of the Cash Management Task Force.
- Served on the following committees:
 - Facilities Planning Committee.
 - Facilities Review and Advisory Committee.
 - Accounting and Business Standards Review and Advisory Committee.
 - Business and Finance Budget Advisory Committee.
- Preparation of Volume 3, *Bonded Indebtedness of Clemson University Annual Financial Report for 1990-91*.
- Provided various scheduled and as-requested reports for the vice president for business and finance to include:
 - Debt service revenue projections.
 - Excess debt service projections.
 - Permanent improvement project reports (PF700).
 - Ratio analyses.
- Completed College Business Management Institute.

Finance and Investment

This area supports the University through endowment and investment analysis, financial reporting and maintains relations with the State Treasurer's Office, brokers and banks. Major accomplishments of this office for 1991-92 included:

- Hired a senior accountant for the E.A.R.T.H. Project.
- Implemented the financial reporting system for the E.A.R.T.H. Project. Accepting this responsibility enabled the E.A.R.T.H. Trust to save approximately \$24,000 in outside computing expenses.
- Updated the University's investment policy for the Board of Trustees.
- Produced quarterly endowment reports for the Board of Trustees.

Purchasing

Purchasing and Supply Services serves and supports the entire University in the procurement of goods and services, information technology and consultant services. Major accomplishments for this office in 1991-92 included:

- Presented two procurement code training seminars for Clemson University employees.
- Through May 1992, the Purchasing Division has issued approximately 1,011 bids and processed 5,650 purchase orders at a value of \$37.9 million.

- Various agency contracts have been established to allow volume buying and reduce processing time.
- Space renovation for information technology procurement officers' offices has been completed.
- The University Receiving Station has processed 64,587 incoming shipments.
- The Purchasing Division administered for Surplus Property three sealed bid sales during 1991-92, yielding \$6,059.26.
- As of July 1, 1991, all purchase orders have been processed electronically, streamlining the procurement process.
- The Purchasing Division has done extensive training of departments on the automated procurement system.
- Continuing education of our personnel — three of our purchasing agents — Harold Harris, Deneen Wright, and Pamela Hassan — completed National Institute of Government Purchasing Public Purchasing Courses toward being certified as Professional Public Buyers.
- Developed computer source file for the on-line purchasing system for specific vendor categories.
- Established 29 Information Technology Agency contracts which allow for volume procurements at a higher discount as well as increased levels of service to users.
- Established a better information on-line base for Purchasing and user departments (ex., vendor files, status of requisitions, time lines on quotations, etc.).
- Established a well-organized system of keeping vendors, as well as departments, informed regarding Information Technology Agency contracts.
- Developed and received approval of the Information Technology Plan for 1992-93.

Risk Management and Safety

The Office of Risk Management and safety provides services in the area of property and liability insurance, loss control, environmental health and safety and workers compensation. In 1991-92 the major accomplishments of this office included:

- Achieved goal of converting insurance policies to common expiration date of July.
- Served as chair of Accident Review Board which reviewed automobile accidents, screened drivers' licenses for employees and provided defensive driving for 282 participants.
- Processed 482 claims for workers' compensation, automobile liability, tort liability, fire insurance, data processing, comprehensive and collision and inland marine insurance; reviewed 150 contracts.
- Clemson University removed 65,248 pounds of hazardous waste at a cost of \$1438,754.74 in 1991-92.
- Procured a commercial compactor as part of the rad waste reduction effort; initial cost of approximately \$19,000. The compactor produced a direct savings of \$9,000, not including surcharges of \$3,000, the first time it was used. This machine paid \$12,000 of its own cost within the first six months of use.
- Acquired a Liquid Scintillation counter essential to the Rad Safety Program at no cost to Risk Management and Safety. This machine will need replacement in the future at a cost of approximately \$20,000.
- Decontaminated extensive contamination of one laboratory at a total cost of approximately \$1,500 including labor. A similar job at MUSC at Charleston by outside contractors cost \$20,000.

- Developing formal procedures for SCDHEC approval for: Transfer of rad material, personnel monitoring of exposure of ionizing radiation, processing of rad waste, calibration of rad detection instruments, posting of radiological control areas and emergency response.
- Completed OSHA training requirement for Electrical Safety Related Work Practices for all employees who work with electrical equipment.
- Designed and formatted a comprehensive inspection and abatement form for inspection program.
- Designed a Supervisors' Analysis Report of Accident or Loss Control Incident form to be used by all supervisory personnel when reporting accidents.
- Designed and implemented a FY 1992 training schedule and published it in the personnel services training catalog.

Business and Financial Affairs

This program area provides the campus with goods and services through Accounting Services, Business Affairs, Sponsored Programs Accounting and Compliance, and Business Services. Emphasis has continued during the year to reduce paper flows, evaluate processes, evaluate and recommend policies and procedures, and improve reporting mechanisms and internal controls. Revisions were completed for the Clemson University Policies and Procedures Manual, the guide for department heads, and the travel policies guide. A new manual, the *Clemson University Sponsored Programs Policies and Procedures Manual*, was distributed during the past year. The Business Services area continued to implement uniform operating procedures for Business Service operations and to expand services to the campus community.

Accounting Services

Continuous improvement remains a high priority for the accounting areas. Improved service and self-evaluation continue to be our objective.

- Financial Systems — Our goal is to make the accounting system a user's management information system. Extensive efforts have been made to review, define and evaluate user's requirements. Focus group forums were held for departmental users to prioritize system needs and define improvements. An immediate result of these forums was the simplification and reduction in the number of expenditure object classes. The improvement of cash management and property inventory reporting are priorities.
- The addition of the PC-based IMRS MicroControl software is making a substantial change in the availability and timeliness of management information. Further implementation of this software and other IMRS software will provide additional information in the format which is more meaningful and useful to management.
- Process Studies and Task Forces — Staff members have served on the Work Order, Ethics, TIWET and Cash Management Task Forces. The accounting area in coordination with other departments is implementing task force recommendations.
- Training — Accounting for Related Organizations and Accounting for Fixed Assets provided training and update workshops for the departmental users. Accounting Services participated in a series of accounting year-end planning meetings. Plans are being made to sponsor a Basic Fund Accounting workshop.
- International — Accounting has been involved in establishing international banking relationships and accounting for research projects in Dominica, Costa Rica and Panama, and graduate programs in Italy and Germany.

- **Accounting Principles** — Accounting has been actively involved in the debate and offered comments on proposed changes in accounting principles by the Financial Accounting Standards Board and the Governmental Accounting Standards Board. We also have participated in group discussions on accounting and financial issues through SACUBO, NACUBO, SCACPA (S.C. Association of CPAs) and the SCGFOA (S.C. Government Finance Officers' Association).
- **Efficiency Moves** — Reorganization within the department has resulted in the elimination of non-essential procedures and more efficient processes. Accounting has continued a cross-training program to provide the additional depth needed for essential services.
- We have changed from a metal equipment tag to an adhesive backed bar code equipment inventory decal. This change has allowed us to implement a plan for putting decals on departmental equipment.

Business Affairs

Bursar's Area

Graduate Assistants were allowed to sign a promissory note to payroll deduct their fees at the beginning of the fall semester, and the note carried forward to the spring semester, eliminating the need to attend registration and sign a second note for graduate assistants. The Bursar's Office, in conjunction with the Registrar and DAPS, experimented with allowing students to pay fees early for both summer school sessions. This proved beneficial to the students and will be advertised for the summer of 1993. The processes of assessing and payment of fees were combined into one this summer in Martin Hall. Students had only one administrative individual to communicate with relating to fees. Training and implementation of electronic data capture machines was complete by August 1, a deadline imposed by the state treasurer. Considerable coordination was involved with the State Treasurer's Office, S.C. National Bank and departments which accept charge cards. Several improvements to automate manual processes were coordinated with the assistance of DAPS, including: automatic transfer of housing debts to prevent duplication of data entry; automatic printing of guaranteed student loan notes for first time borrowers, a mandate by the federal student loan program; printing of the student loan officer's name to prevent hand-written notes; and transferred student refunds from the A/P system to SRS to prevent duplication of data entry.

Non-Student Receivables

A new position was added to administer the departmental credit card program. The first cards have been issued for phase one of this project. The American Express Travel Program and the Budget Rental Car were transferred to this area to administer and communicate to the campus the benefits of these programs. With the assistance of Payroll and DAPS, a new data field has been added to the payroll database to distinguish those employees who have the AMEX card to coordinate the employee status with American Express. The responsibility of coding student payments and assisting in data entry was placed on this department in August 1991. Reconciliation of the employee travel advance fund also was transferred to this department in 1991.

Accounts Payable

A new position was added to this department to assist in disbursements. More than 115,000 vouchers were audited during the 1991-92 fiscal year totaling nearly \$125 million. A reorganization occurred in August 1991 to combine all travel reimbursements under one supervisor and one A/P audit staff. Several Travel Task Force recommendations were implemented including other recommendations by the Purchasing/Payables Task Force. A committee was formed in January to begin the feasibility study of automating disbursements. Considerable time and effort have

been placed in this committee. Discount vendor files were created to help expedite payments from vendors offering Clemson a discount. The staff was trained in implementing a new automated purchase order and receiving report. Considerable time and effort have been spent working with academic and administrative departments, Purchasing and DAPS in this area. Site visits have been made to several universities and private industries for the A/P system including Georgia Tech, The Medical University of South Carolina, Virginia Tech and Fluor Daniel. Several new employees have visited A/P for one-on-one training. Nineteen year-end closing meetings were held in conjunction with Accounting Services. An A/P Newsletter to departmental contacts was initiated to help improve policy communication. Three new employees joined the A/P staff to replace employees who transferred or were promoted.

Many Business Affairs staff served on numerous task forces and new committees formed this year, including, but not limited to: A/P Committee, Computer Steering Committee, Budget Control Committee, Travel Management Task Force, Cash Management Task Force, Student Registration Committee, Payroll and A/P Committee, Certification Task Force, Utilities Task Force, Business Classification and Compensation Advisory Committee, Credit Card Committee, Student Insurance Committee and TIWET Task Force I and II.

Several Business Affairs staff attended seminars on time management, introduction to supervision, TQM, debt collections, CBMI, NACUBO and the Bursar's Professional Development workshop.

Sponsored Programs Accounting and Compliance

As Clemson University expands globally in sponsored research with projects in Africa, Asia Central America and the Caribbean, the Office of Sponsored Programs Accounting and Compliance is highly challenged to administer these projects efficiently and effectively. Nevertheless, the Office of Sponsored Programs Accounting and Compliance is taking an aggressive stance in meeting the challenge by utilizing its most valued resources. With enormous input of ideas from internal staff members and the programming support of Administrative Programming Services, several database revisions are being implemented. These revisions will save real time by eliminating manual processes involved in accounting information data entry and reporting distribution. Tremendous cost savings will be realized in employee time and form reproduction costs with the enhanced on-line capabilities.

The Office of Sponsored Programs Accounting and Compliance has implemented a reporting mechanism for campus-wide compliance as mandated by the federal government. The federal government mandated that recipients of federal funds have compliance programs certifying the enforcement of all applicable laws ranging between equal opportunity, drug free workplace and procurement integrity, to animal welfare. Currently, a quarterly reporting schedule is used.

With the addition of a records and reports manager, Sponsored Programs Accounting and Compliance ensures that Clemson is in compliance with various sponsors as well. This office makes certain that all reports prepared by the records and reports manager and by the principal investigator are completed in a timely manner to avoid nonpayment or other disputes by the sponsor.

Cash management activities focus primarily on keeping sponsored programs accounts receivable at a minimum. As outstanding invoices are monitored and aged, extensive follow-up measures are taken. Every avenue is exhausted to receive payment, thereby, greatly reducing turnaround time.

Business Services

Business Support Services

Business Support Services expanded dining options for the University community by opening franchise outlets for Taco Bell and Li'l Dinos on campus. These

projects coincided with an upgrading of the image and appearance of the East Campus Store which also included an expansion of the deck to include a seating area.

The food service area was reviewed by a peer group of nationally recognized college and university food service professionals. As a result of the peer review, a contract administrator has been hired to provide oversight for the food service contract and to coordinate nutrition education and counseling for students.

Other expanded services include the delivery of any menu item from the Canteen, improved vending service, and the use of the East Campus Store to sell agriculture products.

Agriculture Products Sales Department

Ag Sales Center

- Added a new neon crayon sign to display specials, highlight new items, and help move slow-moving items. Customers had real good response.
- Repricing of cheese was accomplished with purchase of a pricing gun which allowed us to use our labor more efficiently by being able to price cheese in spare time.
- Introduced sugar cones to be sold at a premium. First month's sales were 598. Customers are happy.
- Introduced malted milk shakes to be sold at a premium. First month's sales were 632. Customers were very happy.
- Cash register receipts show increase in sales during first quarter over last year. (July, +49 percent, August, +26 percent, September, +41 percent)
- 17 - 18 percent of total business occurs between 5 - 9 p.m., our expanded hours. That business is growing all the time.
- Was a part of the Benefits Fair and gave out white milk, chocolate milk and pamphlets. Chocolate milk was the biggest success.
- Coupons that were given out this year played a large part in increased business. They were received as followed:

1991 orientation	826
Bookstore buy back	51
Student mailboxes stuffed.....	325
Coupon booklet.....	262
- New flavors of ice cream:
 - Peanut Butter Cup — very good, best ever, too expensive, but customers loved it.
 - Banana — good, but sales were very average at best.
 - Cookies & Cream — A winner! Customers love it, and it is reasonably priced.
 - Heath Crunch in Chocolate IC — Good product, but very average sales.
- Greek Contest a very big success! Other organizations want to be included next year.
- Every 50th large milkshake free promotion was very successful; 20 percent increase in large milkshake business over the preceding week, and a 5 percent increase in small milkshake sales.
- New signage is wonderful! This includes two new signs at the road (one at each entrance to parking lot), new sand-blasted wood sign by front door, and one lighted sign on canopy by front door. Customers, staff and faculty all had favorable comments.

Dairy Processing Plant

- New ice cream flavors very successful.

- New pint containers for ice cream were designed and purchased. Initial sales of pints are slow, but will wait until students return in fall to pass judgment.
- Ordered and installed new milk tri-processor; continuing to train on this equipment.

Cheese Manufacturing Facility

- Started the mail order business; advertised too early. Most sales were by word-of-mouth. Filled 414 orders. Only had two orders not reach customers on time (0.5 percent). 99.5 percent of customers happy!

Central Stores

- Completed renovation and stocking of Central Stores showroom with office supplies and office furniture in preparation for formal opening.
- Addition of canvas awning with Central Stores logo over the entrance of the Central Stores showroom.
- Held formal grand opening of Central Stores showroom in September 1991. This transformed the Central Stores concept to an operation capable of being able to accommodate walk-in customers in a retail-type shopping environment in addition to the normal mail-in order and delivery service previously available.
- Initiated program to facilitate FAX orders for customers who prefer to FAX their orders for office and janitorial supplies.
- Expansion of product lines in both office supplies and janitorial supplies from 396 stock items to more than 700 stock items. This represents a 76 percent increase in products stocked in Central Stores for FY 1991-92.
- Installed a suggestion box for customer responses.
- Extended operating hours of Central Stores from 8 a.m. to 5 p.m. for customer convenience.
- Installation of data terminal in showroom to accommodate walk-in customer orders.
- Installed custom-made signs over each counter in showroom to assist customers with merchandise location.
- Prepared and distributed leaflet describing the services available and operating hours at Central Stores.
- Initiated Special Order Program for customers that desire custom orders or special orders for merchandise not stocked in Central Stores.
- Began pursuing program for recycling of printer toner cartridges in hopes of saving money for departments in addition to contributing to the recycling effort.
- Began purchasing as many unbleached paper towels as possible for University departments instead of bleached paper towels. This resulted in a 45 percent savings to University departments as well as helping with the environmental concerns issue.
- Addition of business machines to Central Stores inventory (FAX machines, typewriters and calculators).
- Reduction of 50 percent or more in the time required from the receipt of an order to the delivery of the same order.
- Substantial reduction in the number of back orders for supplies almost to the point of elimination.
- Began cross training employees at Central Stores to have a more efficient operation.
- Continued reduction in inventory dollars of existing overstocks in office and janitorial supplies has made it possible to expand total product mix

without much increase in total inventory dollar investment. Inventory turns should begin to increase partly due to this procedure.

- Participated in the Faculty and Staff Benefits Fair. Samples of new products were distributed, and new products were displayed. Listing of new products also was distributed to staff and faculty members.

Information Support Services

New equipment was purchased for University Printing Services and the Union Copy Center which improved and added services and significantly improved turn-around times. A new film processor, plate processor and numbering equipment were added at University Printing Services. A state-of-the-art Ricoh color copier was installed in the Union Copy Center.

The Novell network computer system in University Printing Services continues to be updated and expanded. The network now includes the inventory and the complete estimating system. Several enhancements have been made to the system and employees continue to attend training seminars to update their knowledge of the system and the software programs available on the system.

A new computer was added at the Union Copy Center. The center now has its own on-line inventory system. The PUBNET copyright permission system also is being accessed for 24-hour turnaround of copyright permission request.

Four policies and procedures manuals for the different areas of Business and Finance have been completed. A fifth, the *Facilities Manual*, should be complete by September 1992. An employee handbook also was completed and distributed to all University employees.

Printing Services employees continue ongoing safety programs and procedures. A hazardous chemical seminar was attended by one of the supervisors. All material safety data sheets are updated. Each employee submitted medical histories for the emergency file. The University Fire Department gave a hands-on demonstration on the use of fire extinguishers.

Employees continue to be cross-trained in the different areas of Printing Services.

New papers stocks have been introduced. Printing Services now prints on coated stock. Recycled paper product lines continue to be expanded. Soybean inks are also now used.

Marketing personnel coordinated Business Services participation in the fall 1991 annual Benefits Fair and Student Orientations conducted during the summer. Information brochures, literature and signage were completed for each area.

Work continues on comprehensive marketing plans for each Business Services area.

Surveys were prepared and completed for several Business Services operations. These surveys were instrumental in several new services and products being offered.

Training seminars were coordinated for Business Services employees.

Laundry

The University Laundry completed the installation of an evaporative cooling system to relieve the severe heat stress on workers in the plant area of the laundry. New uniforms were issued to workers in Facilities Maintenance and Operations. All uniforms for this department are replaced on a two-year schedule. The laundry also began installing card readers on all washers and dryers for acceptance of the Tiger Stripe card. The laundry also installed a new dry cleaning machine to comply with hazardous waste regulations and reduce supply costs.

Transportation and Communications Services

Telecommunications

- Coordinated installation of telephones in the president's office and the Police Department as part of the state's emergency network.
- Established storeroom concept for telecommunications supplies and began a new inventory control program.
- Printed 10,000 student telecommunications handbooks; distributed a handbook to each of our 7,000+ resident students.
- Improved customer service to students by:
 - placing new seating in the lobby to make it more comfortable and attractive;
 - providing a University directory and telephone directories for surrounding cities in the lobby so students can look up telephone numbers without incurring directory assistance charges;
 - placing a suggestion box in the lobby.
- Conducted a seminar on cellular telephone services and radio paging services.
- Installed a new closed circuit and CATV loop at the football stadium for the athletic department.
- Installed a new public address system at the soccer stadium.
- Installed circuits to carry AT&T long distance calls directly from toll center in Greenville to our ESSEX system. AT&T will no longer have to pay Southern Bell to process these calls; AT&T will pass savings to the University by discounting outgoing long distance calls. Significant savings have resulted.
- Relocated telephone equipment at Littlejohn Coliseum to accommodate remodeling.
- Installed fiber optic cable to provide improved telephone service in Poole Agricultural Center, Lightsey Bridge Apartments, Riggs Hall, Earle Hall, Freeman Hall, Lowry Hall and Olin Hall.
- Designed and solicited bids for a campus-wide Video Communications System.
- Moved the telephone system for the Richland County Extension Office to their new building.
- Installed five new campus emergency phones with blue lights.
- Completed a rewiring project in Riggs Hall.
- Participated in student orientation sessions.
- Added the Call Trace feature to our telephone system. Worked with Public Safety to develop a procedure for using the Call Trace feature to assist in annoyance call investigations.

University Post Office

- Relocated mechanical mail sorter from Student Post Office to Postal Distribution Center; had machine repaired so that it may be used to sort incoming barcoded mail from USPS; began using the barcode sorter daily, sorting all incoming letters that are compatible to the equipment.
- Began compiling extensive data of mail volumes and other mail production criteria to assist managers in long-term forecasting, as well as efficient scheduling, supervision and enhancement of mail services to the University.
- Implemented a mid-route drop of mail to be metered, providing metering clerks additional time and ensuring that all mail received is metered in same day.

- All University postal employees (excluding the director, administrative specialist B and six-month temporary employees) were reclassified to better reflect work being performed.
- Published articles in *Inside Clemson* regarding the early availability of Christmas stamps, proper packaging tips and availability and distribution of used interoffice envelopes.
- Processed 2,977 student packages during Valentine's Day week, compared with 1,577 processed the previous week.
- Performed a transit study of mail to Germany to compare delivery times of contract mail services and the U.S. Postal Service. As a result, changed the international mail courier contractor from DHL to TNT.
- All Postal Distribution Center employees toured the main post office in Greenville and observed mail processing.
- Worked with Extension Service to reduce mail costs by consolidating outgoing/incoming mail to/from county offices with the purchase and use of mail pouches.
- Published a brochure on University mail services and box rental information for freshmen and transfer student orientation.

Transportation Services

- Converted to computerized maintenance shop work-order processing. Received S.C. Division of Motor Vehicle Management "Outstanding State Maintenance Facility" award for fourth consecutive year for professional efforts exceeding program standards.
- Training:
 - Six mechanics received training and certification in air-conditioning maintenance related to freon installation and recovery.
 - One mechanic received training on Chrysler's Passive Restraint System.
 - One mechanic received training on Chrysler's Throttle Body Injection System.
 - All shop personnel attended OSHA workshops.
 - One mechanic received training on 4-wheel anti-lock brake systems.
- Placed into service a freon recovery machine. All shop personnel were tested and certified in the use of the machine.
- "Specialized" vehicles received were two new police scooters (to replace old units) and one new Paratransit bus (fleet addition).
- Ordered new automated Transportation Management system from CCG Systems of Norfolk, Va.
- Ordered/received new 5-1/2 ton truck under-frame vehicle hoist for use on shuttle buses and dump trucks.
- All remaining University vehicle repair shops received State Division of Motor Vehicle Management certification during the year.

Personnel Management and Development

Personnel Management and Development consists of four major areas, specifically, Wage and Salary Administration, Payroll and Benefits, Personnel Services and Employee Development. The associate vice president is responsible for overall administration and leadership of the University's non-academic human resource activities including classification/compensation activities, payroll and fringe benefits for faculty and staff, employee training and development, employee assistance program, retirement, employment practices and employee relations programs.

Personnel Services

The Personnel Services Office serves the employees and administration of Clemson through a variety of programs and activities. Examples of these programs and services include: employment referral services for all non-faculty (staff) positions; employee relations, training and assistance programs; retirement administration counseling services; administration of some employee benefits such as leave, holidays and unemployment; policy development and administration; coordination and distribution of the *Personnel Policies and Procedures Manual*; maintenance of the official personnel records for the University; maintenance of the personnel database; and the Division of Human Resource Management's database.

Major accomplishments of this department during 1991-92 included:

- Complete reorganization and focusing of organization. Developed the computerized applicant referral system including a skills inventory. Referred 9,477 applicants for staff positions, and a total of 19,077 referrals.
- Initiated and coordinated 2,779 retirement and retirement service credit actions; had 91 retirements, 14 of those on disability.
- Continued the Pre-Retirement Education Workshops. The computerized Friendly Retirement Education Database (FRED) and the Optional Retirement Counseling Program are continuing efforts for employees.
- Continuing revision of the *Personnel Policies and Procedures Manual* with the ultimate objective of using the computerized DORIS system to update and communicate the information in the manual; revised seven policies and implemented three new policy procedures.
- Processed more than 24,975 personnel actions; continue to do direct input into Statewide Human Resource Management.
- With the Division of Administrative Programming Services, implemented electronic leave system and electronic form processing for 25 departments. Currently testing Electronic Personnel Actions in three departments.
- Implemented on-site clerical testing for all clerical applicants.
- Started four Reduction-in-Force plans; finalized one for 13 employees, preceded by mandatory referrals for 19 employees.

Wage and Salary Administration

Major accomplishments of this department during 1991-92 included:

- Received delegation of Dual Employment from the state.
- To improve our liaison and visibility, a day was spent on site with the FMO paint shop and the steam plant. Made visit to Columbia to gain and share information and ideas. Invited state analyst to Clemson to offer training. Corresponded with director of DHRM concerning being a pilot agency and on-line submission of position descriptions.
- Conducted eight seminars to educate the campus on how to write position descriptions that are in compliance with ADA noting essential/nonessential functions.
- Raised the amount of increase that can be given for reclassification, reallocation and promotion to 10 percent (the maximum amount not requiring State approval) to maximize benefits to Clemson employees.
- UCCAC and BCCAC were formed as a user advisory group. W&S established procedures and form to allow post audit of salary actions.
- Conducted 132+ job audits; responded to 19 salary surveys. Reviewed 852 dual employment request forms and 74 hire above minimum requests. Approved/received approval of 309 reclassifications.
- Initiated entering state job specifications on DORIS. Test database developed.

Payroll and Employee Benefits

The Payroll and Employee Benefits Office provides service and support in the areas of compensation and employee services, the administration of mandatory and voluntary benefit programs for employees, and the management of the University's contribution to all benefits programs. Major accomplishments of this office for 1991-92 included:

- Produced *Your Personal Statement of Benefits 1992*, a personalized employee benefits booklet for each permanent full-time University employee. It was distributed in April 1992.
- Completed fall enrollment for the state health insurance program with scheduled meetings on campus and at all off-campus locations.
- Re-enroll the Medical Spending Account and the Dependent Care Spending Account through the Money-Plus Flexible Benefits Plan.
- Redesigned and published the voluntary deductions programs and Long Term Care Insurance brochures for distribution to University employees.
- Revised and reprinted the *Benefits Summary* brochure.
- Sorted and distributed W-2 Forms for all active employees with their paychecks, resulting in significant savings in mailing costs for these forms.
- Conducted the third Benefits Fair to explain employee benefits. Approximately 1,500 employees participated with 65 exhibitors.
- Continued the Payroll Procedures Workshops to inform administrative employees of appropriate payroll procedures and to assist in their understanding of the payroll/personnel system.
- Revised the VHS orientation tape for new employees to reflect changes in the insurance program and distributed it to all off-campus locations.

Employee Development

The Employee Development Department is responsible for providing training seminars, workshops and conferences for all University employees. The department also is responsible for administering the Employee Assistance Program and the Employee Recognition Program. Major accomplishments of this office for 1991-92 included:

- Conducted 48 different seminars/workshops.
- User Driven Design: Annually conducts a training needs survey to all employees and SAS analysis of respondents' input. In addition, analyzed the data from all participants which is to be used to design the training program for FY 92-93.
- Total seminar/workshop participants: 4,625 plus 1,425 at Benefits Fair. Participant evaluations of the various workshops indicated a very high degree of acceptance.
- Completed phase one of Apprenticeship Training Program for Facilities Maintenance and Operations as a partnership project; second phase began July 1, 1992.
- Coordinated Associate in Business Training Program for secretarial and clerical employees.
- Distributed alcohol and drug policy to all permanent employees; also included policy and vocational rehabilitation information in New Employee Orientation.
- Counseled and referred 23 employees to vocational rehabilitation or other counselors for advice and guidance.
- Developed formal contact sheet for employee assistance to be used to document employee/supervisor problem and referral given.
- Conducted employee attitude survey and SAS analysis regarding opinions of Business and Finance professionals.
- Distributed *Staff Handbook* at the 1991 Benefits Fair.

- Distributed 258 service pins for Clemson employees.
- Coordinated Employee Suggestion Program (10 suggestions/one award)
- Designed and coordinated Americans with Disabilities Act training and implementation at Clemson.

Administrative and Computing Services

Administrative and Computing Services consists of four departments: Business Information Systems; Employee Relations; Financial Services; and Management Services. These departments provide planning, information, and management resources to the entire Business and Finance organization.

Business Information Systems

Business Information Systems completed numerous projects to enhance Business and Finance networks. Four older networks which had low reliability and high maintenance costs were replaced with two high-performance networks. These new networks allowed for improved ability to share software, data and peripherals, such as laser printers. Along with these new networks, Business Information Systems has implemented a new PC-based E-mail system to improve communication throughout the division. This E-mail system was obtained at no cost and provides connectivity to all other E-mail systems on campus.

Business Information Systems also reduced departmental computing costs by providing equipment maintenance and making popular software available at a lower cost. By using spare parts from older and surplus computers, Business Information Systems handled many equipment problems at little or no cost and eliminated costly maintenance contracts. This department also obtained software at reduced prices through site-licenses and volume discounts, and then distributed the software to Business and Finance units at cost.

In addition to these services, Business Information Systems offered several training courses in the use of microcomputers, DOS, Microsoft Windows and WordPerfect to staff members in Business and Finance and other University areas. Additional classes will be provided this year covering other major spreadsheet, wordprocessing and database software.

Employee Relations

The Business & Finance Employee Relations Council was formed in 1986 to serve as a communications link between the vice president and the more than 500 non-exempt employees in the division. To further the work of the council and improve responses to employee concerns, an employee relations coordinator was employed in September 1991 to deal exclusively with employee relations as well as a number of quality issues.

During FY 1991-92, the Employee Relations Council (ERC) met five times. In addition, the ERC coordinator and the vice president met with employee groups from: Custodial Services; FMO Air Conditioning, Electrical, Plumbing, Carpentry, Preventive Maintenance, Paint, and Sheet Metal Shops; Landscape Maintenance; Accounting for Related Organizations; Business Affairs; Accounting Services; Budgets & Financial Planning; Business & Financial Affairs; Business Services; and Sponsored Programs Accounting & Compliance.

In January '92 ERC groups were reorganized by department numbers. This provided more logical representation, improved continuity, and facilitated the updating of employee lists.

Accomplishments in FY 1991-92:

- Communicated to employees the purpose of the Employee Relations Council and encouraged its use.
- Provided supervisory personnel with statement of the role of the employee relations coordinator.
- Elected 16 new representatives and alternates

- Developed statement of responsibility for council members and alternates
- Addressed a number of employee issues ranging between improving employee break areas to safety concerns.

Goals: Reduced response time to employee concerns, better communication among departments, enhanced work environments for employees, and improved employee morale.

Financial Services

Financial Services was established to provide guidance to other business and finance units in the areas of internal control and accountability. Strategic and tactical plans were developed to accomplish this, including performing risk analyses and assisting units in responding to and implementing audit recommendations. Fostering an organizational environment of internal control is a top priority for this office.

Management Services

Management Services is responsible for directing Business and Finance's Continuous Improvement Program. This program includes: process reviews by task forces, peer review teams, and consultants; specialized management reviews; and, detailed analysis of the organization's performance utilizing specialized computer software.

Management Services worked with, and facilitated the operations of, 13 internal process review teams or task forces. Each task force published its recommendations for improvement and worked with management to develop an implementation plan. Management Services developed a tracking program to assign responsibility for implementation of the recommendations and to monitor implementation progress. Also included in the tracking program are consultant reports and peer reviews by respected administrators from other colleges and universities.

An organizational performance review was conducted for the Business Services area using the Organizational Analyst software. The study reviewed the activities for each employee in the area and measured the cost of conducting activities.

Management Services consolidated information from all other Business and Finance areas and published the *Business and Finance Strategic Plan* and the *Business and Finance Annual Report*. The strategic plan outlines the goals for Business and Finance in both long-term (strategic) and short-term (tactical) terms. The annual report is a celebration of the many and varied activities performed by Business and Finance employees in the previous year.

In a continuing effort to save money by eliminating needless activities and steps in University processes, Management Services researched the origin of numerous requirements and recommended the elimination of unnecessary certifications. Management Services also directed the development of a departmental credit card to be used for small purchases. Using a credit card instead of the currently used Direct Purchase Vouchers for purchases under \$500 has the potential to save the University tens of thousands of dollars.

INSTITUTIONAL ADVANCEMENT

The Division of Institutional Advancement is designed to create and enhance the University's communication and support programs. The division comprises the offices of University Relations, Public Affairs, Alumni Relations and Development. These units work with the University Board of Visitors, the Clemson Alumni Association and the Clemson University Foundation to communicate the mission and activities of the University and to enhance its image; to provide service and programming to Clemson alumni and friends and to seek service and broad support

from alumni and friends; to attract and manage private financial gifts in support of Clemson's academic and administrative operations; and to manage the constituent database gift and computer systems necessary for the aforementioned endeavors to occur. A report on each unit follows.

University Relations

Greater efficiency and the use of high technology equipment characterized operations of the departments within University Relations during the 1991-92 fiscal year.

In Agricultural Communications, budget reductions forced a trimming of overall production in publications and news releases. However, some highly targeted communications activities, such as a food safety seminar for S.C. journalists, strengthened the relationship between the department and the media. This also was the year Extension introduced for-sale publications, resulting in considerable additional staff time to manage inventory and sales procedures.

The Board of Visitors continued its regular activities of two on-campus visits this year. In addition, the board also awarded its second set of awards for outstanding graduate teaching assistants, helped the admissions office recruit highly qualified students, and began a more targeted governmental relations program through its Legislative Affairs Committee. A small group of present and former Board of Visitors, including two University trustees, made an overseas trip in March to visit two Clemson University activities in Italy: the MBA program in Pordenone and the architectural program in Genoa.

In the Communications Center, the new equipment purchased with the \$950,000 oil overcharge grant is in place and operating. As a result, television production has increased significantly. In addition, the AG*SAT satellite uplink gave agricultural faculty the opportunity to program to sites throughout the nation. This year more than 100 hours of video programming was distributed in this manner. More than 40 high-quality multi-image productions were completed this year, a number of them involving six and nine projectors.

In Historic Houses, relationships with engineering and architectural faculty led to a research project on the best way to conserve and stabilize historic buildings and materials. Elaborate scientific measurements of temperature and moisture are being recorded from a number of locations at Fort Hill. From this data a new climate control system will be designed. We believe this process could become a national model for historic structures. A new staff member in this department (split with the College of Architecture), an African-American archaeologist, has started a number of new programs. More than 23,000 visitors came to Fort Hill, which was open 361 days.

In Publications and Graphics Services, using sophisticated computer technology, the professional staff has increased the volume of their work by about 25 percent while reducing costs. The market-oriented admissions materials produced last year resulted this year in a 15 percent increase in applications. This year's total redesign effort is focused on housing publications. This activity is part of a three-year plan to redesign all materials aimed at potential students. Publications and Graphics Services utilizes a time-management program and a computer job-management system to achieve greater efficiency and overall cost reductions while maintaining a very high level of quality and productivity.

The University Relations administration, working with the Communications Center, produced a new slide-tape presentation on the Archbold Tropical Center and a video on former Clemson athletes. The latter was used by Alumni Relations at Clemson Club meetings this spring. In addition, this May production began on a video for the Class of '43's fiftieth anniversary.

1991-92 was another year in which the communications professionals in University Relations demonstrated their value to the University in many different ways. Departmental reports follow:

Agricultural Communications

Without two nickels to rub together, it was hard to become the best agricultural communications department in the country in 1991-92, but we gave it a good shot.

Partnerships, models and new paradigms helped.

If people are our greatest resource, the attitudes of Agricultural Communications staffers represented our greatest accomplishment during the year. We remain energetic, creative and results-oriented. Our morale is strong.

A number of individual accomplishments and honors during the fiscal year underscore those points.

Elizabeth Hall was elected chair of the Media Relations Special Interest Group of our 650-member international professional association, Agricultural Communicators in Education (ACE). Hall also was nominated for the ACE Pioneer Award in recognition of her contributions to the profession and the organization. As our ACE state representative, Hall continues to develop new partnerships with other land-grant communicators. We are collaborating on projects and visiting each other's operations to share ideas and procedures.

Pete Pepinsky received the ACE Award of Excellence in Marketing, the first time that honor has been given. Pepinsky also was one of 40 invited participants in an international conference in Dublin, Ireland, on communicating biotechnology to the public.

Hall, Pepinsky and Adrian Bailey presented invited papers before the Agricultural Communications Section of the Southern Association of Agricultural Scientists (SAAS). Pepinsky also chaired the section and served on the SAAS Board of Directors.

Danny McNeill received the University Relations Topcat Award in recognition of his professional accomplishments and the high regard of his colleagues.

Bailey was honored by the Martin Luther King Jr. Birthday Council for Jackson County, Ga., where she grew up, as the first African-American in her county to pursue a career in journalism.

As a team, the department was recognized by ACE with a second place award in international competition for a food safety workshop targeting journalists statewide. Sponsored by the Clemson Extension Service, the S.C. Broadcasters Association, and the S.C. Press Association, the one-day program's goal was to attract journalists and provide multiple, often controversially contradictory views of food safety issues. Nationally recognized speakers came from the EPA, the FDA, Accuracy in Media, the Food Marketing Institute, Greenpeace, Consumers Union, Clemson and the Medical University of South Carolina. News media participants told us they were impressed by the breadth of viewpoints instead of a parade of Clemson speakers — a new paradigm for such an attraction.

Total Quality Management flourishes in Agricultural Communications. We developed a feedback mechanism for all publication and news clients. The survey cards, put into operation in mid-April, ask clients to evaluate four aspects of our work on a scale from excellent to poor: Did we meet your objectives, were you treated courteously, did we deliver when we said we would and do you feel good about dealing with us again.

We have received 68 completed cards from clients in the initial two and a half months of the program. Twenty were from publications projects, and our "grade point average" (four points for excellent, three for good, etc.) in publications is 3.85. We have received 48 completed cards for news projects, and our grade point average is 3.7. Our combined grade point average is 3.725.

In addition to the feedback cards, we conducted a lengthy self-study in preparation for a Cooperative States Research Service (CSRS) Review of Agricultural Communications and the Communications Center.

In addition to the feedback cards and CSRS review, we participated in two graduate student-driven surveys and held an open house for all clients.

Information gleaned from these feedback mechanisms tells us that we need to educate some clients on our mission and priorities.

In a year of successive budget cuts, we introduced for-sale publications in Extension and collected \$38,761 at last count, 28 percent of the \$137,500 budgeted by Extension for publications. For most of the fiscal year, the Bulletin Room out-sold the sum of all 46 county Extension offices 12-1. A growing acceptance of the for-sale procedure by county offices enables us to project far greater sales figures in subsequent years.

Other departmental totals for the year reflect economic and production restraints, plus new priorities in our downsized operation.

We produced 306 publications projects during the year, a new low for annual totals in our records. That decrease, from 396 in 1990-91, is explained by four factors. First, the Extension administration pulled publications funds from departments and created a printing pool of \$150,000, cut mid-year to \$137,500. In previous years, Extension printing had totaled \$350,000 to \$425,000 a year. Extension also began its latest four-year plan of work in 1991-92. Second, the first year of a four-year cycle, as seen in 1987-88, is typically light for publications volume as program teams determine their needs. We can expect higher volume for 1992-93, as was the case in 1988-89. Third, some wrinkles in the approval process at the Extension assistant director level kept a number of projects in limbo for as much as half the fiscal year. Fourth, in our downsized operation, where once a print production manager and a graphics manager handled contact with vendors, bid specifications, project scheduling and filing, those duties now fall on two editors and three artists.

The transition from free-distribution to many for-sale publications has not been easy. A year ago, the annual, 1,000-page Agricultural Chemicals Handbook stood virtually alone as a for-sale item. At last count, we have 81 for-sale titles. That total includes all materials for pesticide applicator certification, previously handled by another department. The increase in for-sale publications produced a need for secured storage space to protect the valuable inventory. Caged space was assigned to our department by Vice President Milton Wise.

When fewer publications are produced, for-sale publications are introduced and fewer Extension specialists and agents exist to conduct programming, publications distribution volume is likely to decline. It did in 1991-92, from 972,923 (1990-91) to 646,585.

News release volume dipped from a five-year high of 421 in 1990-91 to 393 for 1991-92. Several factors account for that slight decline. As we downsized our operation, we prioritized our work carefully. "Hometown" or individualized releases on award winners and other smaller news items which had been handled predominantly by student writers in recent years have been de-emphasized in our news operation that has 20 percent less full-time professional staffing and no part-time student help.

"Ask Dr. Di," a very successful weekly advice column for young people was discontinued because the Department of 4-H and Youth Development chose to reassign the specialist who wrote the feature. Our news editors targeted specific editors and reporters for monthly or more frequent direct contact, pitching high-priority stories instead of relying on mailed releases. Significant priority was given to the previously mentioned food safety seminar for S.C. journalists, which required six months of planning. The results proved the investment of time very worthwhile.

In light of an internal audit of animal research facilities at Clemson and in preparation for World Animal Liberation Week in April, Agricultural Communications and News Services joined forces to conduct media training for more than 60 scientists, technicians, farm managers and graduate students who deal with animals on campus. The training was a success. Many participants have requested follow-up sessions.

Food editors from 13 Southeastern magazines and daily newspapers took part in a two-day tour of food producing and processing facilities in South Carolina and Georgia May 13-15. The tour was financed with a grant from the USDA Extension Service.

We also planned public relations aspects of dedications of The Institute for Wildlife and Environmental Toxicology's facilities in Hampton County and Chariton, Iowa. We are preparing a public relations strategy for TIWET.

Publication Client Analysis 1991-92 for Ag Communications

Major Client Departments	Number of Jobs Produced	Dollar Volume
Home Economics	73	\$ 27,205.54
Youth Development and 4-H	52	20,375.47
Agricultural Communications	25	3,245.28
Extension Administration	20	27,080.07
Agricultural and Biological Engineering	17	23,000.38
Horticulture	16	33,474.42
Entomology	14	40,918.80
Agricultural and Applied Economics	14	4,473.01
Agronomy and Soils	13	12,858.92
Animal, Dairy and Veterinary Sciences	13	4,058.59
Experiment Station Administration	10	11,445.79
Agricultural Chemical Services	8	3,253.99
Extension Forestry	6	11,409.65
Plant Pathology and Physiology	5	3,396.31
Aquaculture, Fisheries and Wildlife	4	2,515.92
Fertilizer and Pesticide Control	3	1,280.30
Poultry Science	3	1,032.00
Pee Dee REC	2	3,949.27
Food Science	2	2,153.00
Livestock and Poultry Health	2	210.42
Visions for Youth	2	303.19
Communications Center	<u>2</u>	<u>88.94</u>
Totals	306	\$ 237,729.26

Board of Visitors

One of the key volunteer groups which serves the University's institutional advancement program is the Board of Visitors. Through this program, 40 prominent business leaders serve as advisers to the University during two-year terms, visit the campus for updates on programs and priorities, and help provide a two-way communications link between the University and the public in their respective communities. The program is an important vehicle to involve key leaders in the University where no other opportunity may exist.

This important advisory group to the administration was very active during the past year.

Preliminary work began to establish a Legislative Advocates Program, a statewide network of Clemson supporters that will be called on from time to time to contact legislators on issues of importance to the University. The Legislative Relations Committee of the Board of Visitors will provide leadership and direction for the program.

For the second consecutive year, the Board of Visitors Award for Outstanding Graduate Teaching Assistants was presented at the board's spring meeting. The two recipients each received checks for \$500. In December 1991, the solicitation of former and current members resulted in additional contributions of \$3,900 to a fund which was created in 1990 and will eventually be used to endow this award. At the end June 1992, the account balance was \$5,388.94.

The Quality Student Contact Program continued for the fourth consecutive year, a board activity which focuses on recruitment support aimed at S.C. high school seniors with high promise for academic excellence and achievement. This year, 217

names of in-state students who have been accepted for fall 1992 enrollment as freshmen (with a predicted GPR of 3.2 or higher) were distributed among the membership of the Board of Visitors during March.

The board's overseas trip to two University facilities in Italy — the College of Architecture's Charles E. Daniel Center for Building Research and Urban Studies in Genoa and the MBA program in Pordenone — took place in March 1992. Current and former board members participated.

Members of the Board of Visitors are nominated by the Board of Trustees and appointed by the president of the University. They are assigned to four working committees: academic affairs, legislative relations, media and research.

Communications Center

This has been a watershed year in the recent history of the Communications Center. Our facilities were replaced and refurbished as a result of the \$950,000 Oil Overcharge Grant, our statewide network of satellite receiving sites was installed and inaugurated in mid-year, and our leadership role in the development of the AG*SAT consortium began to pay dividends as we distributed more than a hundred hours of satellite programming to statewide and nationwide audiences.

As anticipated, the new production equipment in the hands of a highly talented and motivated staff, produced a dramatic increase in the Communications Center video output. In fact, 785 program units were completed, a 37 percent increase when compared with last year's numbers. Average output for the production studio was 4.5 program units per week. The classroom studio produced an average of 11 programs per week during the academic year, including 476 hours of live telecampus programming. The field production unit completed more than seven program units each week.

Concurrent with the increase in production was a dramatic increase in satellite transmission and reception. From the transmission antenna atop the Poole Agricultural Center, 102 hours of video transmissions were uplinked to sites across the nation. Additionally, the number of satellite receptions (downlinks) increased proportionally to a total of 225 — a 29 percent increase in activity. Our tape duplication activity continues at a maximum capacity of about 100 in-house copies per week. Another 60 copies per week are produced out-of-house.

Our photographic services unit completed nearly 6,500 work orders this year, averaging 27 completed work orders per day. On average, each photographer completed more than five assignments each day. During the year we completed the entry of 30 years worth of negatives into a computerized archival data base which now includes nearly a third of a million negatives.

The art and graphics unit saw a 30 percent increase in its output of computer graphics. In total, the two illustrators completed an average of 35 art orders per week. Projects ranged between complete displays to individual charts and graphs, to complex illustrations. More than 40 multi-image productions were completed, including a large number of three, six or nine projector shows.

Audio/radio production efforts included 31 soundtracks and 312 radio programs which were aired on 35 stations statewide.

After purging old titles and adding new ones, the media library increased its total holdings by 40 titles. A new on-line computerized catalog and ordering system was instituted and is in full operation, responding to approximately 20 orders per day. The audio-visual equipment loan service complied with an average of 67 requests per week. This 16 percent drop in activity results directly from the fact that more and more classrooms have become equipped with AV facilities, and fewer instructors are required to borrow equipment directly from our service. We did, however, see a 10 percent increase in the number of requests for projectionist support.

Though our major concern continues to be adequate funding to maintain, repair and replace our equipment, we appear to be making some headway in planning for covering those shortages. However, a new concern in the area of operating funds (supplies, travel, telephone, postage, etc.) is emerging. Our operating budget from

Extension and Experiment Station has dropped dramatically as a result of the recurring budget cuts and their funding sources. As a result, though Extension and Experiment Station provide more than 55 percent of our personnel budget, they are providing less than 30 percent of our operating costs. Unfortunately, this comes at a time when demand for services, especially from Extension, is increasing dramatically as a result of the new video network to the county offices and our growing involvement in AG*SAT.

In last year's report, a dramatic increase in the quantity and quality of our output was predicted. In fact, we exceeded our own expectations, and we are faced with demands that exceed the staff time available to us. Hopefully the new year will see the completion of the statewide satellite network as well as the addition of sufficient staff to handle networking responsibilities.

Historic Houses

Within the University's Department of Historic Houses there is a strong commitment to: technology and innovation through scientific research of the best ways to conserve and stabilize our historic buildings and materials; energy conservation facilitation through reuse of our historic buildings and grounds for a variety of educational purposes; communications through architecture and landscape interpretation including promotional outreach; and, to an interdisciplinary approach that has involved students, faculty and staff from the departments of architecture, forestry, horticulture, languages, fine arts, landscape architecture, education, textiles, engineering and facilities in the research and public education process. The Department of Historic Houses' mission continues to be to present the houses/buildings in a posture that will foster a public understanding of the origins of Clemson University within the context of the rich heritage of the state and nation.

During the past year we:

- Opened the John C. Calhoun House Museum to the public 361 days, and more than 23,000 visitors toured the House and grounds.
- Opened the Hanover House Museum to the public every weekend, during special events and by appointment.
- Reappointed the Historic Houses Advisory Committee, chaired by Michael Kohl and composed of 14 faculty, deans and administrators from several University departments and two community members.
- Received a contribution of time, talent and money from more than 75 volunteers from the Lake & Hills Garden Club and the University Horticulture Club for the Holiday Celebration at both house museums.
- Developed an audio-visual fund-raising tool concerning the Hopewell restoration both for the general audience and for the Pickens descendants.
- Collected sufficient admission donations to employ 10 part-time students throughout the year and to support the department's general operations for seven months.
- Identified and cultivated major donors for the Calhoun House, Trustee House, Hopewell and Hanover House.
- Published the Department of Historic Houses long range plan which addressed the issues of personnel, finance, education and facilities. The plan reinforces the department adherence to American Association of Museums and the Association for Preservation Technology Code of Ethics as well as the Department of Interior Standards for Rehabilitation.
- Developed an itinerary for a New England fall maritime heritage cruise for the Alumni Association.
- Initiated product development for the Museum Store.
- Coordinated with the Publications and Graphics Department the design of seasonal light pole banners serving as directional aids to the National Register Historic District.

- Composed and delivered 10 proposals to state, federal and private funding sources for general operations and special projects.
- Cultivated and secured 10 percent of the Campaign for Clemson goal established for Historic Houses.
- Developed and constructed an exhibit for Cooper Library celebrating 50 years of having the Hanover House located at Clemson University.
- Performed an archaeological study of Cemetery Hill in preparation for preservation and expansion with the assistance from 19 S.C. Archaeological Society and community volunteers.
- Obtained financial assistance from the Department of Human Resources for support of the archaeology and historic site guide programs.
- Conducted the archaeology summer field school, which attracted participants from other major universities and archaeological societies.
- Instructed 98 Clemson Career Workshop high school sophomore students during the summer session concerning African-American culture and traditions via historical archaeology.
- Promoted community relations through department staff and faculty volunteer efforts serving as guest lecturers and consultants to area organizations and educational institutions.
- Designed and conducted a noon-time walking tour series for the National Historic Preservation Week in May.
- Developed and implemented a model climate control study upon conclusion of a workshop taught by William Rose from the University of Illinois Building Research Council.
- Compiled training manuals for house museum general conservation and interpretation.
- Completed and implemented student projects in the museums, such as developing a visitor survey, translating the Visitor's Guide into French, computerizing the Hanover House collection inventory, analyzing the Hanover House structure to minimize intervention when moving, and collected African-American oral histories associated with the Calhoun and Clemson families.

Department Growth Chart

	1990-1991	1991-1992
Museum Visitor Attendance*	4,500	9,500
Museum Visitor Donations*	\$5,000	\$10,000
Department Permanent Staff (Full-time)	2	2.5
Department Minority Employment (Full and part-time)	0%	40%
Department Student Employment and Interns	4	26

*For a selected six-month period beginning December 1st of each year.

Publications and Graphics Services

The Department of Publications and Graphics Services provides marketing research, design, writing and production expertise to produce collateral materials that support the University's efforts to recruit students, faculty and staff; develops materials to enhance fund-raising efforts; produces advertising-oriented promotional materials for campus events; and is responsible for consistent implementation of the University's identity program in publications.

In 1991-92, the department completed 450 jobs and carried over 87 jobs into the new fiscal year. In FY 90-91, we increased volume by 25 percent; that maximized our production capabilities with existing staff. What is not reflected in the number total is the complexity of the jobs. We have completely revamped many

publications this year and have produced more sophisticated brochures. We are making a transition to the "high-end publications" and concentrating our expertise where it makes the most impact on the total advancement effort.

The results are in from the complete revamp of the admissions publications, and applications are up nearly 15 percent. The research for admissions proved a solid foundation for this year's complete revamp of the housing publications. With additional research and testing, housing publications are more focused and directly target high school seniors and their parents. The housing publications are an integral part of our three-year plan to revise all publications for potential students. This year we also rewrote and redesigned *Tiger Times* and will produce another in the coming year. Our focus this year has been to concentrate on students who have made an initial inquiry about admission to Clemson. Our goal is to continue to recruit them throughout their decision-making process. The final phase of this project will be to apply the research to individual college recruiting efforts.

The College of Engineering will be the first to have its publications strategically integrated into the total admissions publications effort.

We also have had successes in areas that can be attributed to new approaches in publications. Last year the performing art series enjoyed a 50 percent increase in sales when compared with the previous year. Bruce Cook says that the only promotional change is the redesign and rewrite of the publications. We also took a new approach with lecture collateral. Previously, they had a flyer, a poster and a table tent. This year, we combined the flyer and poster and for the same budget produced "flashier" pieces that were more effective. The Chartres lecture was overflowing, and the Shakespeare Festival was successful. Our clients believe that the quality of the promotional materials, both in concept and message, is a contributing factor to their success.

We have been actively involved in the development of the marketing plan and printed materials for the Clemson Golf Course. Throughout the year we have been involved in the planning for the victory celebration of the capital campaign and the development of the overall "look" for the event. We have worked closely with the Alumni Association and have begun a coordinated family of publications for them.

Again this year we have seen a decrease in dollars spent on printing — down more than 17 percent over last year and 26 percent lower than FY 1989-90. Total production costs were \$521,114, down from last year's total of \$611,405. This downward trend is directly linked to equipping the department to become more efficient and capitalizing on emerging technology in the printing industry. Most of the larger projects now are sent directly to the printer on disk, eliminating the costly and time-consuming paste-up process. Secondly, since all colors are separated on the computer, this saves costly stripping of negatives in the prepress process and thus lowers printing costs. Equipment purchases made through reallocating budgets over the past two years have more than paid for themselves through production increases and cost savings to the University.

This year, Publications continued to do more, do it better, for less money and in less time. Several things have contributed to meeting those goals. First, a time management program is in place. Second, a more fully computerized job management system has helped in tracking and bidding jobs. (This was developed in FY 90-91 and instituted at the beginning of this fiscal year.) Third, relief money was requested on projects that would have traditionally been sent to agencies. With this relief money, temporary help was hired to work in-house at a fraction of agency prices. Fourth, we have attempted to maximize the utilization of our computer system so it can do everything for us that it is capable of doing.

There has been a 30 percent turnover in staff in the office this year. The building also has undergone a major renovation this year, and in spite of major inconveniences, the staff has maintained its level of production.

Public Affairs

Public Affairs comprises the Department of News Services, Department of Constituent Communications and the Columbia Public Affairs Office. The collective mission of Public Affairs is to accurately and effectively represent Clemson to its many constituencies.

In addition to the activities represented in the following departmental reports, the associate vice president for public affairs assumed responsibility as University counsel for matters related to the 1991 Ethics Act, legislation that significantly amended state law with regard to lobbying and lobbyists and the code of conduct for public employees.

Constituent Communications

In 1991-92, Constituent Communications continued to run a very high quality periodicals program, publishing three issues each of *Clemson World*, *Clemson World News* and the *Campaign for Clemson Partnership Report*, along with 24 issues of *Inside Clemson* (faculty/staff newspaper) and eight issues of *This Month at Clemson*, a public calendar.

Constituent Communications also wrote and helped produce the *Campaign for Clemson Final Report* and the *1991 President's Report*, which won a Bronze Medal in the 1992 CASE national recognition program, and provided staff support to President Lennon on the biweekly *President's Letter*. Staff also scripted the dinner and slide presentations for the campaign final victory dinner and the annual Clemson Medallion dinner and helped with many other special communications projects as needed.

Among the significant new initiatives and achievements in 1991-92 were:

Improving internal communications: The birth of *Inside Clemson*. A new publication made its debut on July 19, 1991. After nine months of research and development, the biweekly tabloid newspaper *Inside Clemson* replaced *Clemson Weekly* as the University's faculty/staff newsletter. It immediately was embraced by employees as THE need-to-read publication for faculty and staff.

Response — in the form of story ideas, suggestions and calendar/bulletin board submissions — doubled and then quadrupled over the level of input received by the previous newsletter.

A readership survey in June 1992 drew thoughtful responses from 661 individuals (13 percent of the audience). Of those respondents, 91 percent said they "always" (58 percent) or "usually" (33 percent) read *Inside Clemson*. If the publication should ever expand, readers by a two-to-one margin prefer it to stay the same size (four pages) and come out weekly, rather than grow to an eight-page biweekly.

Since *Inside Clemson* currently is a biweekly paper, and news doesn't always happen on deadline, there are two other vehicles in the *Inside* "family" of publications — *News Specials* and *Inside FA X*, a flash communications tool that came in particularly handy last year to update the campus on a daily basis about the disappearance and presumed abduction of a female graduate student.

News Specials are one-topic fliers sent overnight to all employees. *Inside FA X* notices are typically faxed to vice presidents and deans for further distribution.

Improving community relations: The calendar program. *This Month at Clemson*, a one-page calendar of events, is published monthly during the academic year and once for the summer. It was introduced in September 1991 and also has met with tremendous response.

About 5,000 copies are given to the performing arts department to mail off-campus to season-ticket holders, friends of the Brooks Center and others; the department dropped its "monthly reminder" in favor of our more attractive calendar. Another 5,000 copies are distributed to the public at banks, stores, restaurants and other gathering places throughout the community. Many community members have

contacted Constituent Communications to compliment us on the calendar and thank us for making this information on University events available to them.

With the hiring of a calendar manager in January 1992, a much-delayed project was reactivated to put the University's master calendar into a database that would be accessible from any terminal on Clemson's computer system. That system now has been developed in conjunction with the Division of Administrative Programming Services, but the information in the database will be maintained and updated daily by Constituent Communications.

The on-line system should be in place in September 1992 and the future calls for terminals in the community as well.

Campaign communications: The success of The Campaign for Clemson lies in what generous donors have done to increase Clemson's permanent endowment, bring outstanding scholars to campus, initiate new programs and build new facilities.

That success has been leveraged into goodwill for Clemson and a positive momentum for the 90s by the publicity and attention the campaign has brought to Clemson. That attention was accomplished through campaign communications coordinated by Constituent Communications.

From the first "quiet phase" announcement, through the inaugural issue of the *Partnership Report* and the February 1991 passing of the \$62-million goal to the final victory celebration, the staff in Constituent Communications has served the campaign and Clemson.

News Services

The Department of News Services was named the best overall news and information program in the United States by the Council for the Advancement and Support of Education (CASE) this year, which awarded the department the Gold Medal — the highest award possible — in the 1992 recognition awards program.

The national honor followed successes in the CASE District III regional competition, in which News Services won a Grand Award for its Back-to-School feature packet for news media, as well as awards of excellence for the Clemson camshaft PR campaign and the overall media relations program.

In addition, the department contributed to another award-winning project — the *1991 President's Report*. News Services contributed the report's unifying theme, The University as Citizen, and served as resources for the information contained in the CASE Bronze Medal-winning publication.

Highlights of the work that led to those recognitions follow.

Strategic Communications Planning: Each year, News Services develops a communications plan focusing on key messages, major challenges and opportunities for the coming year. The plan doubles as the department's goals document and adheres closely to the University's strategic plan. Developed in consultation with deans, vice presidents and the president, this plan sets priorities and serves as a guide to "key messages" for other departments (such as Alumni or Government Relations) that contribute to the overall mission of communicating the University's relevance and importance to South Carolina and the nation. Its priorities mirror those established in the University's strategic plan: positioning Clemson as a leading, technologically-oriented land-grant University with expertise in 1) the environment, 2) advanced materials, 3) biotechnology and 4) undergraduate teaching.

National and International News Coverage: News Services exceeded its goal for national publicity by more than a third, generating coverage in the *New York Times*, *USA Today*, *Wall Street Journal*, *Washington Post*, *San Francisco Chronicle*, national Associated Press, *Boston Globe*, *Chicago Tribune*, *Detroit News*, *Chronicle of Higher Education*, and on National Public Radio, CNN, CBS and NBC. If generated by a for-hire national media consultant, this coverage would

have cost Clemson approximately \$30,000. News Services' budget for national media and media relations is \$6,000.

Media Relations: The level of one-to-one contacts with the news media continued a five-year pattern of increased activity. In 1987-88, when News Services began keeping a running log of all direct media contacts, staff members handled 2,128 contacts. In 1991-92, that total was 3,834 — an 80 percent increase.

News Release Program: News Services distributed more than 500 news releases in 1991-92, as well as a daily electronically-delivered tip sheet, weekly and monthly calendars for the news media, and frequent faculty-written columns and editorials. In addition, 1,891 hometown news releases were distributed, highlighting the achievements and honors of 8,846 individual students.

SELECTED MAJOR PROJECTS OF 1991-92

Clemson Camshaft: "How do I know that's not like cold fusion? Where's the proof?"

This was the reaction when we first broached the Clemson camshaft story to a national reporter. Offering a 20 percent improvement in automotive fuel economy, coming from a University with no reputation in automotive technology, the invention sounded too good to be true.

In the past year, however, The *New York Times* has written about the Clemson camshaft twice. "Give Clemson Camshaft a chance," said a *Detroit News* column — it "comes from respectable experts at a prestigious school." The *Boston Globe* called the camshaft "revolutionary." On October 29, the Clemson inventors testified before a U.S. Senate subcommittee and on C-Span. The invention has been featured on a popular science television program in Japan and continues to generate worldwide news coverage in major magazines and newspapers.

This recognition is the result an extensive, well-planned public relations campaign. Our news writer, who hadn't known a camshaft from a driveshaft, took a crash lesson in auto mechanics. We coached two engineers in a new language — plain English. We studied the unfamiliar auto pages. We compiled a mailing list that would grow to 300 names. We researched fuel economy legislation and sent out feelers about our engineers offering expert testimony. We contacted environmental groups and lawmakers who might give Clemson a good word as they argued their own case (contacts that later led to an invitation to testify before the U.S. Senate). We prepared an easy-to-understand news release, graphics to illustrate the invention, and a background question/answer sheet with additional details. And for those reporters with an in-depth understanding of automotive or engineering technology, we included technical articles from refereed publications as "proof."

We timed our September 3 release to precede congressional consideration of legislation that would require automakers to improve gasoline mileage. Besides our mailings and calls, the story moved on AP, Reuters and PR Newswire.

The camshaft publicity is helping the University market the technology. The inventors received a letter from the engine component development manager at BMW in Germany, saying he had read about the camshaft in a recent issue of *Auto Industry* and wanted more information about how it works. The inventors had called on BMW earlier and got nowhere, so in this case, the publicity carried the ball. Licensing negotiations currently under way are with a company that learned about the invention not from the University's technology marketing group, but from a news release.

Back to School: Winner of a Grand Award for Feature Stories at the regional level, the 1991 Back to School packet was one of the most successful feature projects of the year.

Designed to help newspapers fill special advertising sections that are a mainstay of the newspaper business, the back-to-school packet provides general-interest stories on topics ranging from getting ready for first grade to paying for college.

Packaged in an orange three-ring binder, the 1991 packet included a mix of hard news, feature stories, editorial columns, info-graphics, a story idea list and a list of sources of information at Clemson. In addition to its traditional statewide distribution, the back-to-school packet substituted for the July national feature packet.

The back-to-school packet generated substantial in-state and nationwide news coverage. One story was distributed by the national Associated Press which goes to 99 percent of all daily newspapers in the United States.

Conference Center: News Services played a key role in the successful efforts to win Commission on Higher Education approval for the University's proposed conference center/golf course complex.

Negative votes have been turned around and positive news and editorial coverage has been generated as a result of a PR campaign that has included holding a news conference, providing tailored packets of information to CHE commissioners, anticipating questions and providing answers, providing media training for officials involved in the project, and making personal visits to key people in the media, higher education and legislative areas.

As the state approval process continues, the department will continue to develop media and one-to-one communications strategies aimed at securing support for the project.

NCAA: The academic year ended with the arrival of a new set of NCAA rules violation charges against the men's basketball program, and News Services again took a lead role in developing communications strategies aimed at informing the public and key constituents as well as minimizing negative news coverage.

Those strategies, which included full disclosure of the unedited allegations, have drawn praise from the news media. They also helped to confine media coverage to the sports pages (rather than news and editorial pages) by not providing opportunities for speculation.

As the investigation continues, News Services will continue to play a key role in helping the University manage the vital communications aspect.

Public Affairs Office — Columbia

In 1991-92 the Public Affairs office in Columbia, which acts as the University's principal contact with the General Assembly, the governor's office and state entities, moved offices within the AT&T building — a move that will save \$13,000 a year.

Budget Bill '92-93: The Legislature adjourned on June 4 for the year and will not return until January 1993. The budget conference committee struggled with numerous items before finally reaching a compromise at, literally, the last hours of the session.

Higher education received \$30 million in new monies. New funds for Clemson University amounted to \$5,072,369 above our actual FY '91-92 budget.

New funds for our PSA budget amounted to \$1.815 million. Another item of positive financial impact was the passage of House Bill 4281 which allowed the University's Regulatory and Public Service Division to retain increases in pesticide product registration fees. This will amount to approximately \$450,000 for that division.

Other Items: The Columbia Public Affairs Office was involved in many other activities besides the budget this year. Requests for information by legislators, staff, and other government officials which were handled by the Public Affairs Office are too numerous to list, but they include information on admissions, housing, financial aid, and a wide array of technical information.

The office worked with the acting dean of the College of Engineering, the provost, and other on-campus officials to secure funding for the new Engineering Innovation Center.

In addition, the Public Affairs staff was actively involved in the following legislative issues:

- Archives and history bill
- Asbestos
- Designation of the state Botanical Garden at Clemson University
- Regulation of pesticide and fertilizer bills
- Assessment in higher education bill
- Higher education counseling for eighth graders
- Equine infectious anemia bills
- Tuition assistance for faculty and staff
- Farm and Animal Research Facilities Protection Act
- Parking regulations
- Japanese beetle regulations
- Restructuring higher education bill
- Post-secondary Education Savings Plan
- Athletic trainers bill
- Drug-free Post-secondary Education Act
- Cancellation of student loans for teachers who teach in both academic and geographic need area
- Provision deleted for free tuition at state-supported colleges, universities or technical schools for persons age 60 and over.
- Inclusion of federal law enforcement officers in definition for free tuition at state-supported colleges, universities or technical schools
- Free tuition prohibited for board members and the immediate families (with exceptions provided) of state-supported post-secondary institutions
- Requirements for promulgating regulations bill.

Legislative Advocates: The Public Affairs Office was involved in the planning for the Legislative Advocates Program — a grassroots volunteer organization to assist Clemson in Columbia.

Alumni Relations

The focus of the Alumni Relations program continues to be on service. During 1991-92 a number of new programs were created, as well as a concerted effort made to enhance the service element of existing programs. The following list highlights the alumni program for the past year:

- Fifty-eight Clemson Club meetings were held across the country, in addition to 150 Young Alumni events, such as happy hours, viewing parties, barbecues, lake parties and harbor cruises.
- Regional leadership meetings were held in four locations across the state and region to bring alumni volunteers together to make plans for future alumni activities in the area.
- Chartered Clemson Clubs increased from 39 to 45. Active clubs now number 85. Fifty-six percent of clubs are chartered, and 83 percent of S.C. Clemson Clubs are chartered.
- The Clemson Club's President's Appreciation Weekend was held on campus, with 36 attendees representing 21 clubs.
- The Clemson in the Lowcountry group continued to grow, with more than 80 chartered members. The Greenville Luncheon Club held six meetings, and Columbia's Second Century group met four times.

- Young alumni representatives on the Young Alumni Council increased from 48 to 58.
- A Young Alumni Memorial Endowment met its initial goal of \$5,000. Young Alumni giving to the Loyalty Fund increased from \$229,906 to \$250,977.
- An alumni headquarters was hosted at all away games, serving more than 1,400 alumni and friends. The alumni package at the Citrus Bowl served more than 1,000 alumni and friends.
- Constituency reunions were held for former student body presidents, Clemson alumni physicians and dentists, alumni band and Clemson Black alumni.
- The Women's Council program developed a brochure to offer membership to any interested female alumnus or student. Response has exceeded 3,500, representing 41 states. Women's Council held receptions in five cities, reaching more than 140 members. The Women's Council also sponsored a student seminar entitled, "Making the Most of Who You Are."
- The Parents' Program continues to expand. The Parents' Council Advisory Board participated in nine summer orientation programs. Also, Parents' Council members adopted the Student Center as their fund-raising project. A goal of \$50,000 was set, with \$38,000 already pledged.
- Student Alumni Council sponsored the Welcome Back Festival with the largest merchant participation ever. The Alumni Master Teacher was Dr. Larry Bauer. An effective officers' retreat was held and the constitution updated.
- The College Alumni Relations Board continued to meet quarterly. The College of Ag Sciences group made excellent progress, hosting three meetings and selecting an alumni board.
- Held high school academic recruiting meetings in eight locations.
- Coordinated all activities for the president's box (250 in attendance for each of the seven games), Medallion Dinner (300 in attendance), new faculty orientation reception (500 in attendance).
- Presented the 1992 Distinguished Service Awards to Jerry E. Dempsey, Warren H. Owen, Charles M. Campbell, Frank E. Lucas and Lawrence M. Gressette.
- A total of 132 special events were managed by the Office of Special Events.
- Many new programs were implemented for Reunion '92, with record attendance from the Class of 1942. Developed a volunteer handbook and worked to coordinate mailings with the Development Office to save money and improve communication.
- Became actively involved in quality management with a TQM training session conducted by IBM, the establishment of a TQM team to analyze our telephone communication system and the establishment of quarterly "Quality Sharing Sessions."
- During '91-92, the Clemson Alumni Association credit card generated \$186,711, bringing the four-year total to \$726,814.
- The Clemson license tag enjoyed a good increase in sales during '91-92. In May the sales surpassed 2,000, at which time the Clemson Scholars program began earning \$20 per tag. During the year, 1,489 license tags were sold with income of \$21,888.
- The PASSPORT Travel program conducted seven trips with 222 passengers.
- A long distance telephone program was approved by the Alumni National Council, and a telemarketing campaign began in February. Initial marketing resulted in 8,087 phone lines being added to the Clemson network, a success rate of 22 percent.

- Approximately \$23,000 in advertising revenues were generated for the *Clemson World* and the *Clemson World News*.
- The University Visitors Center welcomed more than 22,000 walk-in visitors, arranged 234 school and community group tours for 7,551 people and developed and conducted 137 special University research tours for 2,237 conference participants. Also, the Visitors Center incorporated the use of AUTOMAP for directional inquiries from visitors and began the new role as University spokesperson for monthly Elderhostel conferences. The University tour guides gave 476 prospective student guided tours for 5,973 visitors. Tour guides also traveled to alumni meetings to serve as student speakers.

Development Office

The objective of the Clemson Fund is to secure private dollars from individuals, corporations and foundations to support annual, capital and endowment needs for all areas of the University.

Annual gifts support current operations. Endowment gifts are used to establish new faculty and student programs or may be added to existing funds. Capital gifts support new and existing buildings, class projects, equipment, or equipment for new and existing laboratories.

In 1991-92:

- Private gifts to Clemson reached an all-time high of \$17,174,115.53 in FY '92, up \$1,035,311 from FY '91, an increase of six percent in cash gifts. Support from individual, corporate and foundation donors to all areas of the University continues to show encouraging growth.
- Both the number of gifts (19,340) and the average gift (\$888) rose, while the cost to raise a dollar declined from .1193 in FY '91 to .1172. The national average for colleges and universities is 16.5 cents.
- Faculty and staff support increased 97 percent over FY '91. They gave more than \$245,600 — almost doubling their total for the previous year. The number of employee gifts increased from 806 to 896, and the average employee gift jumped from \$155 to \$274.
- Membership in the Presidents Club, the Fellows and The Founders — the three most significant annual gift clubs — rose from 895 members in FY '91 to 1,286 members in FY '92, a 44 percent increase.
- Alumni giving rose 17 percent to \$4.5 million. There were 13,568 alumni gifts averaging \$329 each.
- Total individual giving reached \$6.7 million, up 16 percent from the previous year.
- Corporations gave \$7 million. Other organizations gave \$3.5 million.

Campaign for Clemson Summary

The Campaign for Clemson began quietly on July 1, 1987, with a five-year goal of \$62 million. During the first 29 months — the “lead gifts” phase, chaired by the late Currie B. Spivey Jr. — the campaign’s executive and national corporations committees worked with the University’s top volunteer groups and other key supporters to raise \$40.5 million — 65 percent of the goal.

Lead commitments included more than \$5 million from the Clemson Board of Trustees and more than \$2 million from the Clemson University Foundation Board of Directors.

“The Campaign for Clemson: A Partnership for Academic Excellence” was announced publicly on November 10, 1989, by Chairman Philip H. Prince. The announcement helped close observance of the University’s 100th anniversary and marked what President Max Lennon called “the most significant moment in this institution’s history.”

In the final days, The Campaign for Clemson got its largest single gift from the estate of Mrs. Homozel Mickel Daniel. This generous gift totaled \$2.85 million — \$2.1 million for scholarships and \$750,000 for Clemson's first chair in the College of Architecture.

The Campaign for Clemson ended on June 30, 1992. The final total of gifts and pledges was \$101.1 million.

During five years of The Campaign for Clemson, a number of donors also made deferred gifts through wills, trusts, insurance policies and other such arrangements which were not included in the campaign total figure.

This "campaign-plus" component represents an additional \$13.5 million dollars.

STUDENT AFFAIRS

This year was an active one for the Office of Student Development with the establishment of several major initiatives in student services. The advising relationship with the Student Government Association was improved to develop a student staff partnership approach to addressing student needs. Financial deficits were eliminated, and new accounting practices were established. The Office of Student Development assumed the leadership role for the New Student Orientation Program. A new marketing and registration process was implemented in cooperation with Conference and Guest Services. A fee for orientation was instituted for the first time to support this program. First Year programs were conducted during the year and a First Year Advisory Group was created to provide input of services needed for new students. The "For Your Information Camp" was developed, and 40 students participated during its initial year.

The number of student organizations continues to increase. Individual organization accounts were established on the University main frame computer system for funded groups. WSBF increased its broadcasting power from 1,000 to 3,000 watts following approval from the FCC. *TAPS* sales continue to increase over previous year sales. *The Tiger* was selected as the state's best overall collegiate newspaper by the S.C. Press Association for the third consecutive year.

A vice presidential blue ribbon task force on fraternity and sorority life was appointed to evaluate Greek life and to make recommendations regarding the future of all aspects of this element of the Clemson student community. The fraternity residential area received renewed attention under new staff leadership. A judicial board was established, a central service desk, and programming was increased in the area during this past year.

The number of disabled students continues to increase, particularly those with learning disabilities. Office services have continued to meet the varied and unique needs of this group of students. The second year of the FIPSE Grant for Alcohol Education was completed with continued success of Clemson University Resource Educators (CURE) and the establishment of the Staff and Faculty Educators (SAFE) Team.

The Black Education Support Team (BEST) mentor program continued to grow in number of participants and amount of mentor contact. The Black Students Of Promise Dinner recognized more students for academic achievement than ever before. Eight students were recognized for a 4.0 GPR.

There were numerous additional accomplishments and services offered through the Office of Student Development during the past year. Identifying student needs and developing responses to students continues to be the central mission of the Office of Student Development.

A record high of 1,712 students registered for full-time employment with The Career Center, and 636 registered for summer internships. We continue to feel the effects of the recession with the number of employers recruiting on campus down

28 percent over last year. Usage of our computerized Career Guidance System, SIGI+, increased by 100 percent to 716 users, and we were awarded an Innovation Fund Grant to install SIGI+ at 12 sites on campus. Clemson will be the first school in the country to have SIGI+ available campus wide. We also were awarded a grant to implement "Career Success Strategies For Black University Students."

The Counseling Center continues to experience the trend of increased demand for services. Accommodation for the students has been by expanding the opportunity for therapeutic group work and an increase in presenting preventive mental health programs to classes, clubs and organizations. A highlight of the efforts at the center this year was the formation of Clemson University Crises Debriefing Team. This volunteer group, trained and supervised by the Counseling Center, responded to faculty and staff who are survivors of traumatic events. A team of trained volunteers will meet with groups of survivors to give needed information on psychological and emotional recovery and referral sources for individual assistance.

The year 1991 was great for Clemson students and the Clemson University Union. We produced and presented 695 programs with total attendance of 66,656.

The Union and its many student volunteers continued their quest to provide quality, out-of-class experiences. Some of the past year's highlights include sold-out performances by guitar hero Johnny Winter, comedian Pauley Shore and student favorite Drivin' n Cryin'. The NBA made its first Clemson appearance when the Houston Rockets defeated the Cleveland Cavaliers in Littlejohn Coliseum. Couple these with special events such as the Jack Daniels Original Silver Cornet Band's "Christmas in my Hometown" and the Nintendo Campus Challenge, and it is obvious why our students are so excited!

Clemson experienced another outstanding year athletically. Thirteen of the eighteen teams finished in the top 25 in the nation which is the highest number ever at Clemson.

Individually, 64 student athletes made All-ACC, 27 were named All-American, 109 were selected to the Academic All-Conference team, and 35 made the Dean's List.

University Housing continues to be a popular living alternative for students, with 102 percent of available beds filled at opening in August 1991. The department is committed to improving the quality of accommodations while keeping the space inventory relatively constant. Toward this end, 1991-92 brought about the closing and demolishing of Johnstone B and C sections, the successful opening of the Lightsey Bridge Apartments, and the beginning of construction on Phase I of the new Johnstone Hall.

To facilitate future planning, housing has commissioned a building needs analysis to be performed by the architectural/engineering firm of CRSS. Their assessment of the condition of our facilities will aid in the establishment of priorities for future capital improvements. A 10-year fiscal plan has been developed to support future construction/renovation efforts.

Programs in our on-campus housing areas continue to enhance our residents' living/learning experience. In 1991-92, a record-breaking 1,613 social, educational and service activities were sponsored in campus residential areas. Staff resources were reallocated and a satellite office to support judicial and educational programming areas was opened.

UNIVERSITY RESEARCH

Clemson is ranked by the National Science Foundation among the top 100 educational institutions in total research and development expenditures.

During FY '91-92, the University received gifts, grants and contracts totaling in excess of \$60.5 million. This represents an average growth over the past six years

of 34.3 percent per year. Total sponsored programs and unrestricted research expenditures exceeded \$96 million in FY '91-92.

Clemson provides unusual flexibility and opportunity for sponsors to leverage their research objectives by utilizing the vast array of the University's research organizations. The University's commitment to strengthen public and private research historically has built excellent internal and external partnerships to achieve research objectives. The institutional linkage of University research activities extends across the boundaries of academic colleges, institutes and centers to provide an effective foundation for collaboration and partnerships with government and industrial sectors.

The scholarship activities performed by faculty and administrators at the University significantly contribute to the environment and knowledge required to solve universal problems. During this past fiscal year, Sponsored Programs Administration processed more than 1,800 research proposals, grants and awards.

Department of Research Services

The Department of Research Services is responsible for coordinating institutional compliance with federal laws regulating the use of animals in research, teaching and testing activities; and administering federally mandated committees reviewing all human subject research for compliance with safety guidelines. In addition, the department provides technical and professional support, as well as education and training to University personnel who use animals in research, teaching or testing activities.

Notable accomplishments of Research Services during FY '91-92 include:

- Laboratory Animal Training Classes were conducted once a week for laboratory animal technicians, research assistants, and graduate students involved with animal use in research, teaching and testing.
- The Clemson University Animal Care and Use Seminar was conducted for all faculty, staff and students to meet compliance with federal regulations. Due to high demand, this three-hour seminar was conducted five times in January, with 236 faculty, staff and students attending.
- A six-hour seminar/workshop on anesthesia was conducted with an invited guest speaker. Nine other lectures with guest speakers were sponsored throughout the year, covering various topics on laboratory animals, animals used in agriculture and recreation, public education and awareness regarding animal research, and animal welfare issues.

Emerging Technology Center

The Emerging Technology Center (ETC) was established in 1987 by a grant from SCANA, the holding company for S.C. Electric and Gas Company. The ETC was established to stimulate and assist economic development through the creation and commercialization of innovative new products and processes; to assist with the evolution of new high growth start-up companies; to assist existing manufacturers to upgrade their operations and new product development, and to create innovative technology transfer/commercialization programs for South Carolina. The ETC originated and conducts the state's only inventor's expo and co-sponsors the only venture capital conference in the state. The center assists approximately 100 inventors, entrepreneurs and new start-up companies annually.

Major accomplishments for ETC for FY '91-92 include the following:

- Conceived, designed and constructed the first S.C. "incubator" facility — Clemson Center for Applied Technology (CAT). The 30,000 square foot, \$1.9 million facility was dedicated by Governor Carroll Campbell in March

of 1992. The facility is supported by grants from the Appalachian Regional Commission and the Savannah Valley Authority. The facility is unique in that it "incubates" technology-based startup companies with an emphasis on technology developed at Clemson University. The incubator facility also assists in commercializing innovative new consumer, industrial and medical products and processes. In addition, the facility provides a comprehensive information and database service related to commercialization and technology transfer and houses all major regional and state technology transfer representatives to form a totally integrated network of professional services and staff. Three technology-based start-up companies (two spun out of Clemson University) and five new process/service operations and organizations have located in CAT.

- ETC represents Clemson University on the Technology Transfer Council of the S.C. University Research and Education Foundation (SCUREF). Several innovative programs have been initiated to expose undergraduate and graduate students to technology transfer commercialization activities coming out of the Westinghouse Savannah River Site (WSRS). These include evaluating disclosures emanating from the site and preparing action plans for possible commercialization, defining a curriculum for technology transfer for S.C. universities, and conducting workshops for small businesses identifying new product opportunities from the site disclosures.
- CAT was selected as the state coordination center for the NASA regional technology transfer program.
- To date, ETC has been directly and indirectly responsible for locating more than \$14 million in private support for small, expanding-growth companies in South Carolina and more than \$2.5 million for inventors to commercialize their innovative products and processes. In addition, ETC has assisted in obtaining more than \$400,000 in federal funds to support technology activities at Clemson and more than \$1.4 million in state and federal funds to design and construct the new CAT facility.
- Several entrepreneurial companies are in the process of locating in South Carolina as the direct result of ETC's efforts. These include a company that is licensing Canadian technology for a novel forest product, a medical infusion pump device, and a group of Clemson graduate students who are attempting to commercialize two inventions originating at Clemson University.

Intellectual Property Committee

The Clemson Board of Trustees approved revisions in the Patent Policy on July 12, 1991, and the Software Copyright Policy on September 20, 1992. These policies were developed by the Patent Committee and recommended to the Board through appropriate administrative channels. In addition, upon recommendation from the Patent Committee, the committee's name was changed to the Intellectual Property Committee to reflect the committee's broader scope that includes confidential technology (trade secrets), software copyrights, and trademarks.

The committee reviewed 28 patent and computer software disclosures during the year and approved 20 for processing by the University's private patent attorney and eight for processing through Research Corporation Technologies (RCT). Under guidelines recommended by the committee and approved by the administration, a larger number of disclosures will be sent to RCT in the future. The committee believes this will decrease costs and may improve overall licensing performance.

Estimated income from patents and software copyrights was \$1.6 million. One license agreement was completed during the year and six other agreements are nearing completion. Two U.S. patents were issued.

